Fifth Annual Forensic Science Symposium
March 15 - 16, 2016
International Forensic Research Institute
Symposium Advisory Board

Stephanie Stoiloff
Cecelia Crouse
Agnes Winokur
Bruce R. McCord
Kevin McElfresh
It is with great pleasure that we welcome you to Florida International University for the Fifth Annual Forensic Science Symposium. This conference is a continuation of a series of ad-hoc forensic science meetings previously held in South Florida (Nova Southeastern University, Miami-Dade Police, Broward Sheriff, etc.). This year, we again expect more than 200 attendees from forensic labs, law enforcement, the courts, and industry to join forensic science faculty and students to participate in the symposium. The International Forensic Research Institute is very pleased to host this forum for information exchange that is mutually beneficial to both the forensic science researchers, practicing scientists and the end-users of quality forensic science services. The other aims of this symposium are to provide continuing education opportunities for forensic scientists and to provide the faculty and students an opportunity to showcase their research. The IFRI researchers (faculty and students) strive to work on meaningful research questions therefore we welcome your ideas and want the community to share the pain points so that we can focus our efforts on the most important problems of the day.

This year, we have initiated the High School Student Forensic Academy when nearly 100 high school STEM students from Dade and Broward counties will hear lectures from forensic lab directors, forensic researchers and practitioners and participate in laboratory demonstrations and tours of the IFRI laboratory facilities. The FIU graduate students will also show their recent research in a poster session. Also new this year is an I/UCRC session when the National Science Foundation representatives will present the I/UCRC program and the I/UCRC members and universities will also make presentations to the audience. Our plenary speakers — Mark Stolorow, Director of OSAC Affairs; and our own legal psychologist Nadja Schreiber Compo — will kick off the symposium. In addition to the workshop on DNA mixtures, Elsevier will sponsor a Mini-symposium in Forensic Chemistry to inaugurate the new journal Forensic Chemistry and both Editors in Chief of the new journal will be in attendance. Finally, 24 oral presentations and 20 poster presentations covering the fields of forensic chemistry, forensic biology and forensic psychology will also be presented.

This symposium would not have been possible without the generous support and contributions of our collaborators (Miami-Dade Police Department, Broward Sheriff’s Office, Palm Beach County Sheriff’s Office, Drug Enforcement Administration) and their leadership as well as the corporate sponsors (Illumina, Elsevier, Qiagen, Thermo Scientific, Field Forensics, Applied Spectra). The School of Integrated Science and Humanity within the College of Arts, Sciences & Education is also acknowledged as is the Office of Research and Economic Development for their financial support of this symposium. We are also grateful to the other forensic laboratories and academic programs throughout Florida for their participation and to the faculty, staff and students at FIU’s International Forensic Research Institute for assistance with the coordination of this event.

José R. Almirall  
Director, International Forensic Research Institute
**Program**

**Tuesday, March 15th**

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<td>12 noon – 1:00 p.m.</td>
<td>Registration</td>
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<tr>
<td>1:00 – 1:05 p.m.</td>
<td>Introduction to Provost Furton – Jose Almirall, Director International Forensic Research Institute (IFRI)</td>
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<tr>
<td>1:05 – 1:15 p.m.</td>
<td>Welcome from FIU – Kenneth G. Furton, Provost and Executive Vice President, FIU</td>
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<tr>
<td>1:15 – 1:25 p.m.</td>
<td>Welcome to IFRI and Introduction of Plenary Speakers – Jose Almirall</td>
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<tr>
<td>1:25 – 2:00 p.m.</td>
<td>Organization of Scientific Area Committees for Forensic Science (OSAC) – Status Report and Potential Impacts on Forensic Science – Mark Stolorow, OSAC - NIST</td>
</tr>
<tr>
<td>2:00 – 2:30 p.m.</td>
<td>Challenges in transitioning research into active casework – Eugene Peters, FBI Laboratory</td>
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<tr>
<td>2:30 – 3:00 p.m.</td>
<td>Alcohol and witness memory – Nadja Schreiber Compo, Department of Psychology, FIU</td>
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<tr>
<td>3:00 – 3:20 P.M.</td>
<td>BREAK</td>
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<tr>
<td>3:20 – 4:00 p.m.</td>
<td>Laboratory Director’s Panel on Statistics – Crouse, Stoloff and Winokur</td>
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<tr>
<td>4:00 – 4:15 p.m.</td>
<td>Introduction to I/UCRC in Forensic Science – Rebecca Ferrell, NSF</td>
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<tr>
<td>4:15 – 5:15 p.m.</td>
<td>Presentations from I/UCRC Members – Dubai Police Forensic Laboratory, Field Forensics, Agilent, Applied Spectra, Netherlands Forensic Institute (NFI), George Washington University, Northeastern University, West Virginia University, Florida International University</td>
</tr>
<tr>
<td>5:15 – 7:00 P.M.</td>
<td>RECEPTION AND POSTER SESSION - GREEN LIBRARY (GL) BREEZEWAY</td>
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**Wednesday, March 16th**

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<tr>
<td>8:30 – 9:00 A.M.</td>
<td>COFFEE</td>
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**Breakout Session 1 – Forensic Chemistry – GL 100 – Moderated By Agnes Winoqur**

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<td>9:40 – 10:00 a.m.</td>
<td>An efficient, robust method for the determination of cannabinoids in whole blood by LC-MSMS. Nicholas B. Tiscione, Amber Kohl, Russell Miller, Xiaoqin Shan, Jessica Sprague and Dustin Tate Yeatman</td>
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<td>Evaluation of the Effect of Drug Surrogate Material on Weight Fluctuations and Uncertainty of Measurement Values in the Weighing Process. Amber C. Kohl</td>
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<td>BREAK</td>
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<td>Microextraction Capsules: Integration of Extraction Sorbent, Filtering Medium, and Stirring Mechanism into One. Abuzar Kabir, Rayma Blanco, Rodolfo Mesa and Kenneth G. Furton</td>
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<td>Synthetic Cannabinoid Drug Case Review: A Forensic Chemistry Perspective. Tyrone Shire and Jeannette M. Perr</td>
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<td>Quantitative Analysis of Alfa PVP (Flakka) in Oral Fluid by On-Line SPE couple to Liquid Chromatography Triple Quadrupole Mass Spectrometry (LC-QqQ-MS). Paul Castillo, Luis E. Arroyo and Anthony De Caprio</td>
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<td>11:40 – 12:00 p.m.</td>
<td>Novel standards for the forensic chemical analysis of fingermarks. Shin Muramoto, Thomas P. Forbes, Greg Gillen and Arian C. van Asten</td>
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**Breakout Session 2 – Forensic Psychology – GL 100A – Moderated By Nadja Schreiber Compo**

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<td>Interviewing intoxicated witnesses: Should they be interviewed immediately or when sober? Hoogesteyn, K., Schreiber Compo, N., Powell, M. and Pena, M.</td>
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<td>Variations in Witness Memory Reports as a Function of Language Proficiency. Julio Martin and Jacqueline Evans</td>
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<td>An explicit “not sure” option reduces mistaken lineup identifications and eliminates the harmful effects of the appearance-change instruction. Steve Charman, Brian Cahill, Keith Wylie, Caroline Perez and Brett Waggoner</td>
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<tr>
<td>11:40 – 12:00 p.m.</td>
<td>Forensic Video Analysis: An Investigative Force Multiplier. Juan J. Ruano</td>
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**Breakout Session 3 – Forensic Biology – GL 100B – Moderated By Julie Conover Sikorsky**

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<tr>
<td>9:00 – 9:20 a.m.</td>
<td>The Creation of a Lean Mean Forensic Biology Machine: undergoing a Lean Six Sigma project. Julie Conover Sikorsky</td>
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<td>9:20 – 9:40 a.m.</td>
<td>Knowledge is Power: Validation of Promega PowerQuant QPCR System. Celynda M. Sowards</td>
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<td>9:40 – 10:00 a.m.</td>
<td>STRmix™: From Validation to Implementation. Rachel Oefelein</td>
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<td>10:00 – 10:20 a.m.</td>
<td>The M-Vac. Billy Hausman</td>
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<td><strong>10:20 – 10:40 A.M.</strong></td>
<td><strong>BREAK</strong></td>
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<tr>
<td>10:40 – 11:00 a.m.</td>
<td>Organization of Scientific Area Committees (OSAC) Bloodstain Pattern Analysis Subcommittee Report and Update. Toby L. Watson, F-ABC</td>
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<td>11:00 – 11:20 a.m.</td>
<td>Forensic DNA Mixtures Are Hard Work. Kevin McElfresh, Kelvin Frank, Tania Jean-Louis, Mariel Basurco, Martin Tracey, George Duncan, Roman Koval and Petros Tsingelis</td>
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<tr>
<td>11:20 – 11:40 a.m.</td>
<td>Improved DNA profiles from aged horse feces using Pressure Cycling Technology: Prospective use in forensic cases. Ketaki Deshpande and Dee Mills</td>
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<tr>
<td>11:40 – 12:00 p.m.</td>
<td>Introducing the MiSeq FGx Forensic Genomics System. Danny Hall</td>
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**Workshop – GL 100A**

1:00 – 4:00 p.m. DNA Mixtures Workshop – McElfresh, McCord and Tracey, Lee

**Elsevier Mini-Symposium on Forensic Chemistry – GL 100**

Presenters: Glen Jackson, Kenyon Evans-Nguyen, Bruce McCord, Arian Van Esten, Adam Hall and Tatiana Trejos

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<td>1:30 p.m.</td>
<td>Soft Biometric Traits from the Chemical Analysis of Human Hair – Glen P. Jackson and Mayara P. V. de Matos</td>
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<td>1:50 p.m.</td>
<td>The forensic potential of comprehensive two-dimensional gas chromatography: adding a new dimension to the investigation of arson? – Andjoe A.S. Sampat, Martin Lopatka, Gabriel V. Truyols, Marjan J. Sjerps, Peter J. Schoenmakers and Arian C. van Asten</td>
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<tr>
<td>2:10 p.m.</td>
<td>Strengthening the value of electrical tape evidence in forensic investigations by elemental profilin – Tatiana Trejos, Claudia Martinez and Jose Almirall</td>
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<td>2:30 p.m.</td>
<td>Profiling Metabolites of Drug Adulterants: What can we learn about source attribution for controlled substances that we’re currently missing in the analysis of Forensic Toxicology samples? – Adam Hall and Sarah Hannon</td>
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<tr>
<td>2:50 p.m.</td>
<td>Bringing Direct Analysis in Real Time (DART) out of the laboratory and into the field – Kenyon Evans-Nguyen, Berk Oktem, Brian Musselman, Fred Li, Amanda Quinto and Ashley Windom</td>
</tr>
<tr>
<td>3:20 p.m.</td>
<td>The development of surface enhanced Raman spectroscopy as a method for toxicological drug screening – Bruce McCord, Thaddeus Mostowt and Erica Doctor</td>
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Challenges in transitioning research into active casework
Eugene Peters

Challenges and criticism of forensic science disciplines include wide-spread calls for additional research in many areas. Leading FBI Laboratory research to develop new capabilities, improve extant techniques, and strengthen the scientific foundations of forensic science has provided unique and interesting observations on what it takes to transition research into active use. With an estimated 3,500-5,000 research papers per year published in various aspects of forensic science, one of the key points to consider as we pursue research is the barriers to entry that impede deployment of new technologies and techniques. This talk will discuss some of the barriers we have encountered in transitioning research into active casework.

Alcohol and witness memory
Schreiber Compo, N., Carol, R., Hoogesteyn, K., Evans, J.R., Holness, H., Furton, K. and Rose, S.

A considerable number of witnesses and victims of crime are under the influence of alcohol. Both expert witnesses and jurors believe that alcohol impairs witness memory and a large body of research on alcohol's effect on basic cognitive processes suggests impairment. Only recently has research begun to investigate whether these basic research findings translate into real-world investigative contexts and under which circumstances intoxicated witnesses are impaired when remembering faces and entire events. Surprisingly, both field and lab studies suggest that alcohol may have little effect on witnesses’ ability to remember a face or details of an event, even at high breath alcohol levels. There is some evidence that how investigators interview intoxicated witnesses and whether witnesses are sober or intoxicated at time of recall may affect the quality and quantity of their recall. Implications of this research for real-world investigative interviewing practices and policies are discussed.

Organization of Scientific Area Committees for Forensic A1:C3 (OSAC) - Status Report and Potential Impacts on Forensic Science
Mark Stolorow

The Organization of Scientific Area Committees for Forensic Science (OSAC) was created to provide uniform administration for development, promulgation, and adoption of documentary standards in the forensic science and criminal justice communities. OSAC was developed by an agreement between the US Department of Justice and the National Institute of Standards and Technology empowering NIST to administer OSAC standards development policies and operations. OSAC is a forensic science community effort with a balance of stakeholder participation at the state, local and federal level involving nearly 800 members and affiliates consisting of forensic science practitioners, academic researchers, statisticians, and legal, human factor and quality infrastructure experts. The goal of OSAC is to improve forensic practices through developing documentary standards that can be used by accrediting bodies in future audits of forensic laboratories. This presentation will review the progress OSAC has made to date and examine the potential future impact one hopes may be achieved by OSAC to improve the practice of forensic science and expert testimony in the courts.

SESSION 1 – FORENSIC CHEMISTRY

A Label-Free Aptamer-Fluorophore Assembly for Highly Sensitive and Specific Detection of Cocaine
Daniel Roncancio, Haixiang Yu, Xiaowen Xu, Shuo Wu, Ran Liu, Joshua Debord, Xinhui Lou and Yi Xiao

We report a rapid and specific aptamer-based method for one-step cocaine detection with minimal reagent requirements. The feasibility of aptamer-based detection has been demonstrated with sensors that operate via target-induced conformational change mechanisms, but these have generally exhibited limited target sensitivity. We have discovered that the cocaine-binding aptamer MNS-4.1 can also bind the fluorescent molecule 2-amino-5,6,7-trimethyl-1,8-naphthyridine (ATMND) and thereby quench its fluorescence. We subsequently introduced sequence changes into MNS-4.1 to engineer a new cocaine-binding aptamer (38-GC) that exhibits higher affinity to both ligands, with reduced background signal and increased signal gain. Using this aptamer, we have developed a new sensor platform that relies on the cocaine-mediated displacement of ATMND from 38-GC as a result of competitive binding. We demonstrate that our sensor can detect cocaine within seconds at concentrations as low as 200 nM, which is 50-fold lower than existing assays based on target-induced conformational change. More importantly, our assay achieves successful cocaine detection in body fluids.

A Cooperative-Binding Split Aptamer Assay for Rapid, Specific and Ultra-Sensitive Fluorescence Detection of Cocaine in Saliva
Haixiang Yu, Bhargav Guntupalli and Yi Xiao

Sensors employing split aptamers that reassemble in the presence of a target can achieve excellent specificity, but the accompanying reduction of target affinity mitigates any overall gains in sensitivity. We for the first time have developed a split aptamer that achieves...
An efficient, robust method for the determination of cannabinoids in whole blood by LC-MSMS
Nicholas B. Tiscione, Amber Kohl, Russell Miller, Xiaqin Shan, Jessica Sprague and Dustin Tate Yeatman

Due to the high prevalence of cannabinoids it is desirable to have an efficient method that uses a small volume of blood specimen and requires minimal sample preparation. Although many methods have been reported, they are often labor intensive, require special sample preparation materials, use 1 mL or more of specimen, or are difficult to duplicate. The liquid chromatography with tandem mass spectrometry (LC-MSMS) method presented employs a rapid, simple liquid-liquid extraction, has been successfully applied in two different laboratories, uses 0.5 mL of specimen, and was fully validated. The limit of detection and limit of quantitation obtained were 1 ng/mL for delta-9-tetrahydrocannabinol (THC) and 11-hydroxy-delta-9-tetrahydrocannabinol (OH-THC) and 5 ng/mL for 11-nor-9-carboxy-delta-9-tetrahydropyrcannabinol (THCA). Each analyte demonstrated a linear range of 1-40 ng/mL for THC and OH-THC and 5-200 ng/mL for THCA. The CV of replicate analyses was within 14% and bias was within ± 13%. The validated method provides a sensitive, efficient, and robust procedure for the quantitation of cannabinoids in blood using LC-MSMS and a sample size of 0.5 mL.

Evaluation of the Effect of Drug Surrogate Material on Weight Fluctuations and Uncertainty of Measurement Values in the Weighing Process
Amber C. Kohl, Palm Beach County Sheriff's Office

In the ASCLD/LAB guidance document on the estimation of measurement uncertainty for the drug chemistry discipline, it is recommended that data used when determining the uncertainty of measurement in the weighing process utilize a check standard surrogate of powder material. This drug surrogate should be packaged for stability such that it is sensitive to environmental changes in the laboratory in order to evaluate the variation in the measurement process. In this study, six different drug surrogates including powders, rocks, plant material and tablets were each placed in heat-sealed plastic bags and the weights were recorded daily over a three month period. The temperature and humidity in the laboratory were also recorded each day. This presentation will describe the weight fluctuations as well as effect on the uncertainty of measurement values for each drug surrogate type as compared to an ASTM Class 1 weight.

Microextraction Capsules: Integration of Extraction Sorbent, Filtering Medium, and Stirring Mechanism into One
Abuzar Kabir, Rayma Blanco, Rodolfo Mesa and Kenneth G. Furton

Microextraction Capsule (MEC), a novel high performance solvent minimized sample preparation technique, is presented herein. MEC innovatively integrates high volume of an extraction sorbent, a permeable cylindrical conduit filtering system that protects the integrity of the encapsulated sorbent, and a tiny magnet to diffuse the sample matrix into a single device. The unique design of the microextraction device allows fast and sensitive extraction of target analyte(s) from complex sample matrices including food, pharmaceutical, forensic, environmental and toxicological samples without any sample clean-up exercises such as filtration, centrifugation, and protein precipitation etc. After extraction, the analyte(s) are back-extracted into any organic solvent of choice. Sample pretreatment processes prior to extraction often lead to loss of analytes. MEC, due to its ability to eliminate sample clean-up processes, provides a clean, highly preconcentrated sample in a suitable solvent. The sample can be analyzed in multiple chromatographic systems to obtain complimentary information. A number of recent applications of MEC in different sample matrices will be presented.

Synthetic Cannabinoid Drug Case Review: A Forensic Chemistry Perspective
Tyrone Shire and Jeannette M. Ferr

Synthetic cannabinoids are one of the recent classes of illicit drugs to affect law enforcement and the community. In 2015, the Southern District of Florida successfully prosecuted a high profile synthetic cannabinoid case involving a nationwide distributor. This prosecution resulted in the first South Florida conviction of this case type. This case is noteworthy for the specific analytical and testimonial challenges confronted by forensic chemists – the evolution of analogues and isomers of synthetic compounds and the successful relaying of this information to a jury. Review of the case covers the following areas: initial clandestine laboratory response, evidence seizure and collection, drug evidence analysis, and courtroom testimony. In addition to the analytical challenges, courtroom testimony in this case was unique. The government’s case used two expert forensic chemists and a pharmacologist against a well-organized defense that included two defense chemists and a clinical pharmacology expert. This real world example serves as a potential model for how the forensic chemist expert is incorporated into emerging controlled substance prosecution.
Quantitative Analysis of Alfa PVP (Flakka) in Oral Fluid by On-Line SPE couple to Liquid Chromatography Triple Quadrupole Mass Spectrometry (LC-QqQ-MS)
Raul Castillo, Luis E. Arroyo and Anthony De Caprio

A rapid screening and quantification of Alfa PVP and its main metabolite A-PVP-OH in oral fluid via on-line solid phase extraction (SPE) coupled to a triple quadrupole mass spectrometer was developed. A C18 SPE cartridge was tested to improve the peak capacity of method. The analytical separation was performed on a Zorbax C18 2.1 x 50 mm, 1.8 µm, with a mobile phase of consisting of methanol water with 5 mM ammonium formate and 0.1% formic acid as additives. The completed analytical workflow, which involved sample preparation, extraction and analysis of samples were under 6 minutes. Acceptable correlation coefficients (r²: 0.995) for the target drugs were obtained. Lower Limits of quantitation (LLOQ) were in the order of 2 ng/mL. Interday and intraday variation of quality control samples at three different levels of concentration showing results of below 20% RSD and a bias under 18%.

Novel standards for the forensic chemical analysis of fingerprints
Shin Muramoto, Thomas P. Forbes, Greg Gillen and Arian C. van Asten

In recent years the advancement of mass spectrometric techniques as ToF-SIMS, MALDI-MS and DESI-MS has enabled the spatial chemical analysis of human biological traces of forensic relevance such as fingerprints. The chemical analysis of crime related fingerprints can provide valuable information on an unknown donor and on the activities of that donor at the crime scene. However, although the scientific studies have been impressive, implementation in forensic case work remains limited. One reason for this is the absence of proper quality control related to the limited availability of standards to test and calibrate systems under realistic forensic trace conditions. In this work a novel procedure is presented to prepare artificial fingerprints with calibration arrays of known drugs with the use of inkjet printing technology. With this approach spots containing down to 10 pg and as much as 50 ng of cocaine, methamphetamine and heroin could be deposited on artificial fingerprints with high accuracy and repeatability. In this way suppression of sebum matrix could be accounted for and surface concentration maps of drug molecules in fingerprints could be constructed.

SESSION 2 – FORENSIC PSYCHOLOGY

Eyewitness Choosing Behavior: The Role of Ecphoric Experience and Non-Memorial Cues
Brian S. Cahill, Stephen D. Charman, Caroline Perez, Sara Oramas and Jennifer Younglood

The purpose of this study was to provide an initial test of a novel lineup theory. Results provided support for the novel lineup theory. First, the presence of a non-memorial cue affected choosing behavior and the effect was dependent upon a witness’s ecphoric experience. Second, the presence of a cue differentially altered confidence judgments depending upon whether the cue corroborated or competed with their lineup decision. Third, witnesses took significantly more time when there was a non-memorial cue present in the lineup compared to when there was no non-memorial cue. Implications will be discussed.

Interviewing intoxicated witnesses: Should they be interviewed immediately or when sober?
Hoogestyn, K., Schreiber Compo, N., Powell, M. and Pena, M.

Many real-world eyewitnesses are under the influence of alcohol either at the time of the crime, the interview or both. Only recently has empirical research begun to examine the effects of alcohol on witness memory, yielding mixed results. We examined the effects of intoxication after a delay, holding constant state of intoxication at encoding and retrieval. Should witnesses sober up or recall as quickly as possible? Results suggest that moderately intoxicated witnesses (BAC > .08) recall better when interviewed immediately, than after 1 week (when sober). There was also no advantage of same-state recall for intoxicated witnesses after 1 week.

An examination of law enforcement decision-making during criminal investigations
Melissa Kavetski and Steve Charman

Law enforcement officers are responsible for making numerous decisions during investigations. For instance, when administering identification procedures to eyewitnesses, officers may have to choose which mugshot of the suspect to place in a lineup and will have to decide what filler photos to include with the suspect’s photo. Many officers are also responsible for handling and making judgments regarding evidence. Although research shows that these decisions can have a major impact on the outcome of any case, very little research has examined how officers make these decisions. The current series of experimental studies obtained data from police and sheriff’s departments to examine (1) how law enforcement officers create lineups and (2) whether officers’ initial beliefs of a suspect’s guilt would predict their subsequent ratings of several pieces of ambiguous evidence in a criminal case. Results obtained from a sample of student participants are compared to those obtained from law enforcement officers.
How much is too much? The effects of real-world intoxication levels on witness precision and certainty
Gonzalez, R., Altman, C. and Schreiber Compo, N.

Research on intoxicated witnesses has shown few differences between intoxicated and sober witnesses (e.g., Schreiber Compo et al., 2012). Possible explanations for these findings include the relatively low BAC levels (< .08) tested thus far, allowing for metacognitive adjustments when reporting. The present study tested witness memory across a broad BAC spectrum (.000-.031). Patrons drinking at a bar were recruited, presented with a videotaped mock crime, and interviewed about the crime. Interviews were recorded, transcribed, and scored for both accuracy and precision. Data scoring is currently being completed. A negative correlation between witness BAC and precision level is predicted.

Variations in Witness Memory Reports as a Function of Language Proficiency
Julio Martin and Jacqueline Evans

The present study examines witness reports given by native Spanish speakers. Participants include college students who self-identified as native English speakers, and native Spanish speakers who are learning English as their second language. Subjects watched a video of a mock crime being committed, and were interviewed in English regarding that crime. It is predicted that non-native English speakers will provide fewer details, and less accurate information than native English speakers, but even more so when the non-native English speaker has a low English proficiency. Preliminary results suggest non-native speakers do in fact report more inaccurate details.

An explicit “not sure” option reduces mistaken lineup identifications and eliminates the harmful effects of the appearance-change instruction
Steve Charman, Brian Cahill, Keith Wylie, Caroline Perez and Brett Waggoner

Studies have demonstrated that providing witnesses with an explicit “not sure” option prior to administering a lineup decreases false identifications without decreasing correct identifications. An additional benefit of a ‘not sure’ option is explored: By filtering out low-confidence witnesses, it may mitigate the harmful effects of other lineup manipulations, such as the appearance-change instruction (ACI), which has been shown to increase false identifications. Participants (n = 336) viewed a two-person mock crime, received either (a) the ACI or not, and (b) a ‘not sure’ option or not, and viewed a target-present and target-absent lineup. Consistent with predictions, although the ACI increased false identifications, this effect was completely eliminated by the ‘not sure’ option.

Drunk Not Blind: The Effects of High Alcohol Doses on Eyewitness Identifications
Altman, C., Schreiber-Compo, N., McQuiston, D., Hagsand, A. Cervera, J., Gonzalez, R. and St. Flour, O.

Intoxicated witnesses often exceed the legal BAC limit of .08 (Evans et al., 2009); however, no research has examined how high levels of intoxication impair eyewitnesses’ memory using a lineup procedure. Thus, the present study sought to test witnesses’ memory across a broader (more ecologically valid) BAC spectrum (.00-.32). Bar patrons were recruited to watch a mock crime video after having their BAC level measured. Immediately following the video, participants attempted to identify the perpetrator in the video from a target-absent or target-present lineup. In addition, participants were asked to rate how confident they were in their selection. Results suggest that intoxicated witness’ identification performance parallels that of sober witnesses, but highly intoxicated witnesses are less confident in their identifications. Implications for collecting evidence from intoxicated witnesses are discussed.

Forensic Video Analysis: An Investigative Force Multiplier
Juan J. Ruano

One of the most prolific sources of evidence available to the courts today comes from video images. Today, video images find their way into American criminal and civil trials at a far greater frequency than any other type of exhibit. But how reliable is the vast majority of this evidence? The old adages that “an image is worth a thousand words” and that “video speaks for itself”, may have been accurate when video was recorded as an analog signal to a videotape, but today’s digitally compressed video images, follow no standard and much of it is unreliable and does not accurately represent what it purports to show. This visually dynamic seminar introduces the challenges of leading video evidence in civil and criminal trials and to the importance of accurate expert interpretation of compressed digital video images. Reported case law and effective strategies for protecting valuable video evidence from exclusion motions are explored and demonstrated in detail. Image authentication, image enhancement, photographic video comparison, video interpretation and technical proficiency of the expert witness, training and certification are discussed in this dynamic and fast-moving seminar.
SESSION 3 – FORENSIC BIOLOGY

Organization Of Scientific Area Committees (OSAC) Bloodstain Pattern Analysis Subcommittee Report And Update
Toby L. Wolson, F-ABC

The OSAC was formed in the United States under the “umbrella” of the National Institute of Standards and Technology (NIST), in part, as a response to concerns presented in the National Academy of Sciences Report Strengthening Forensic Sciences in the United States: A Path Forward. The individual subcommittees of the OSAC have served to continue the good work of the various Scientific Working Groups. An open membership application process resulted in committee members being selected in the latter part of 2014. Face-to-face meetings of more than 500 subcommittee members and affiliates have taken place in January of 2015 and 2016 with a third meeting scheduled for July of 2016. The outcomes of the BPA subcommittee meetings along with on-going task group work will be discussed in this presentation. Future tasks and affiliate selection will also be reviewed. Time will be set aside to answer audience questions and receive comments on this global effort to better the forensic sciences.

The Creation of a Lean Mean Forensic Biology Machine: undergoing a Lean Six Sigma project
Julie Conover Sikorsky

Increasingly traditional business tool applications have been translated into the crime laboratory arena. Specifically, the application of Lean Six Sigma (LSS) principles to remove the “unnecessary” and improve the “necessary” in a laboratory’s process flow. In the spring of 2015 the Palm Beach County Sheriff’s Office Forensic Biology Unit (FBU) underwent a five month NIJ grant funded LSS project. The project resulted in a major overhaul to the laboratory’s process flow and extensive changes to the existing management system; evolving from a culture of push to one of pull, from staff being held accountable by the manager to an environment of peer-to-peer accountability. The LSS process and data specific to the FBU’s project will be presented to illustrate the positive impact of organized process improvement and a practical path to the overall reduction and maintenance of casework backlogs.

Knowledge is Power: Validation of Promega PowerQuant QPCR System
Celynda M. Sowards

The Palm Beach County Sheriff’s Office Forensic Biology Unit (FBU) recently completed validation and implementation of the Promega PowerQuantq quantification system for use on DNA casework evidence. PowerQuantq is a chemistry that determines the amount of total human and male DNA while also providing degradation and inhibition information for the sample. PBSo is utilizing this chemistry on the Applied Biosystems® 7500 real-time PCR instrument in conjunction with the PowerPlex Fusion System. The results of the validation demonstrated that PowerQuantq and the 7500 real-time PCR instrument is a reliable system for reference and casework DNA quantification that exceeded the performance of other methods utilized within the FBU. The outsourcing of the validation studies, validation results, training, software features, and implementation on casework will be discussed.

STRmix™: From Validation to Implementation
Rachel Oefelein

Improvements in forensic DNA analysis in recent years has led to the ability to produce DNA profiles from a wider variety of samples, including touch DNA. Touch DNA samples from firearms are common submissions for forensic laboratories in the United States. The nature of gun crime lends to frequent exchange of firearms and as such profiles obtained from firearms are often complex mixtures. STRmix™ software uses probabilistic genotyping to analyze mixtures that may have previously been reported as inconclusive. DNA Labs International acquired a STRmix™ license in 2015 and subsequently validated the software for casework use in accordance with the SWGDAM guidelines for validation of probabilistic genotyping systems. The effect of the implementation of STRmix™ on DNA mixture analysis of profiles obtained from firearms is discussed.

The M-Vac
Billy Hausman

Early forensic DNA analysis utilized Restriction Fragment Length Polymorphism (RFLP) technology which required a large amount of DNA to develop a profile for comparison purposes. Today, Short Tandem Repeat (STR) analysis using commercially available DNA typing kits is used alongside capillary electrophoresis (CE) detection; a much more sensitive system requiring less DNA to develop a profile. Despite these scientific advances, evidence sampling still has limitations and shortcomings. Traditional methods of evidence sampling such as swabbing and scraping, often yield low quantities of DNA; frequently ending up with no results. The M-Vac System is a relatively new instrument that greatly improves evidence sampling through wet vacuum technology. Proven to be significantly more efficient than traditional sampling methods; cold cases that have once been thought to have been at a dead end, are being reopened. In 2014, DNA Labs International acquired this instrument to provide a better and more convenient method of DNA collection. Since its implementation, the M-Vac has proven to be a useful tool in the sampling of many different types of items; including but not limited to clothing, bedding, ropes, and rocks. In order to highlight the potential uses of the M-Vac System, casework examples in which it was utilized will be discussed.
Forensic DNA Mixtures Are Hard Work
Kevin McElfresh, Kelvin Frank, Tania Jean-Louis, Mariel Basurco, Martin Tracey, George Duncan, Roman Koval and Petros Tsingelis

Research and development in forensic DNA analysis using Short Tandem Repeat (STR) markers has resulted in the ability to isolate more DNA from smaller samples and analyze even smaller amounts of DNA. One consequence of the increased sensitivity of the analytical method is that greater than 50% of these small samples analyzed are mixtures of DNAs. Analyzing single source samples in which there is 0.5 ng of DNA is relatively easy and many validation studies of such samples are done to establish the guidelines for the interpretation for STR results. However, when the sample has 0.5 ng of DNA and three contributors those same guidelines become much more difficult to apply in a systematic manner. In fact, a solid analysis is painstaking and time consuming, two resources that are in short supply in a forensic casework laboratory. Worse, there are many instances in which the results are deemed inconclusive. We have examined a series of mixture samples using multiple methods of statistical analysis and databases. Our results indicate that when the interpretation guidelines are employed in a scientific and realistic manner, which is hard work, the overall result is valid and reliable.

Improved DNA profiles from aged horse feces using Pressure Cycling Technology: Prospective use in forensic cases
Ketaki Deshpande and Dee Mills

Feces represent an easily available source of DNA that can be used in forensic cases involving animals. In cases of equine slaughter, fecal samples from stolen or missing horses can be used to identify and match to the remains of a slaughtered horse. In studies of elusive or endangered species fecal analysis allows the sampling of individuals without having to capture the animals. However, often amplification of DNA from feces is compromised by environmental contaminants, dietary inhibitors coupled with low quantity and poor quality of DNA. In the present study, non-invasive sampling of fecal matter from domestic horses was used to develop a method where fecal samples were aged up to six days. Field validation of additional samples was conducted where fecal donors and days since defecation were unknown. We demonstrate a viable protocol for fecal DNA extraction and efficient genotyping using a six equine microsatellite markers.

Introducing the MiSeq FGx Forensic Genomics System
Danny Hall

Sequencing (NGS) by Synthesis (SBS) enables the entire human genome to be sequenced in one day. Whole genome sequencing (WGS) provides access to all genetic differences between individuals, and is valuable in studying disease and biological systems. While WGS delivers the broadest genomic coverage, it also requires the largest sequencing and interpretation effort. As a simpler alternative, forensic scientists can choose to perform targeted sequencing of PCR products. By sequencing a dense set of forensic loci, casework and database efforts are directed toward the genomic regions that best answer forensic questions, relieving privacy concerns and simplifying analysis. Because it does not depend on allele separation by size, the number of targets interrogated is not limited, allowing a more comprehensive result to be generated. We describe the development of the first Next Generation Sequencing system designed specifically for use with forensic applications, the MiSeq FGx™ Forensic Genomics System. The system includes a targeted amplicon panel, the MiSeq FGx semi-automated benchtop sequencer, and a complete sample to answer software solution.

Poster Abstracts

Investigation of Child Abuse Cases by Law Enforcement:A Comparison of Physical Abuse, Neglect, and Shaken Baby Syndrome
Sarah A. Shaffer, Nadja Schreiber Compo, J. Zoe Klemfuss and Julio Mejia

A national sample of law enforcement investigators (N=378) was surveyed regarding professional procedure and experience investigating across three types of child abuse (physical abuse, neglect, and Shaken Baby Syndrome/Abusive Head Trauma). Experiences regarding interrogative approach and suspect admissions were analyzed as the main focus of the study. Investigators were also asked about suspect characteristics and suspect interviewing procedures across these three categories. Initial findings suggest that investigators are most likely to investigate cases of physical abuse as compared to cases of neglect or Abusive Head Trauma. Physical abuse investigations also differed from neglect and head trauma investigations in who the contacting and collaborating agencies are, whether suspects are likely to be repeat-offenders, and the outcome of suspect interrogations. Implications for child abuse investigations as a whole will be discussed.
Colorimetric based paper microfluidic devices for the presumptive determination of seized drugs
Ling Wang, Giacomo Musile, Jashaun Bottoms, Franco Tagliaro and Bruce McCord

Colorimetric reagents have been used for testing seized drugs for many years. Although these reagents provide a useful presumptive determination, they are less convenient and more expensive because of the presence of toxic and corrosive chemicals. We have been working on an alternative platform for colorimetric detection based on paper microfluidics. We have created a six-channel chips that adapt these colorimetric reagents to a multiplexed ready to use format. Each lane performs a different test. In the field, samples are dissolved in a carrier solvent in vials and then applied to the paper just prior to analysis. These devices can be used at crime scenes, laboratories and any other locations where seized drugs need detection. These paper microfluidic devices are easy to prepare and inexpensive to operate and they can be conveniently stored for later use with shelf lives of 2-3 months. The use of paper microfluidic devices permits the development of rapid, inexpensive, and easily operated tests for a variety of seized drugs. They present a safe and convenient presumptive tool for samples that can be used in the field, prior to confirmatory laboratory analysis.

The optimization of pressure cycling technology (PCT) for differential extraction of sexual assault casework
Vanessa Martinez, Deepthi Nori and Bruce McCord

A two-step protocol involving pressure cycling technology and alkaline lysis has been devised as a rapid and selective alternative to conventional differential extraction techniques with an increased recovery of DNA. During the first step of the protocol, the swab containing a mixture of epithelial cells and sperm cells is subjected to pressure-based lysis in alkaline conditions with the Barocycler® NEP 2320 from Pressure Biosciences. The sperm cells left on the swab are then lysed by the application of 0.4 N NaOH and incubation at 95°C for 5 minutes. The sample is ready for purification after only 20 minutes. At 1:1 or 2:1 female to male cell ratios, high selectivity and complete separation can be achieved. But at higher ratios, male allelic dropout is observed. The goal of this research is to modify and improve this protocol to generate a clean male profile even with a large excess of epithelial cells.

The Application of Gold Nanoparticles for the Trace Detection of PINACAs in Urine by Surface Enhanced Raman Spectroscopy
Thaddeus Mostowtt and Bruce McCord

The use and abuse of synthetic cannabinoids has increased significantly in recent years. As more of these drugs become illegal, new synthetic legal versions of these drugs are being made, which presents problems for the forensic scientist as standard methods, such as immunoassays, may not detect the target drug. Raman Spectroscopy is an under-utilized technique for the detection and identification of drugs due to its perceived low sensitivity for analytes in solution using traditional procedures. However, when Raman spectroscopy is performed in the presence of metallic nanoparticles, signal can be enhanced several orders of magnitude, this is known as surface enhanced Raman spectroscopy (SERS). This method has already been confirmed to work for the toxicological detection of benzodiazepines with limits of detection ranging from 1-200 ng/mL. In this project, gold nanoparticles were prepared using a sodium citrate reduction and various aggregating agents were used to enhance the Raman signal of four different synthetic cannabinoids: APINACA (AKB48), AB-PINACA, ADB-PINACA, and AB-CHMINACA, and their metabolites in spiked urine samples.

Rapid direct PCR of an YSTR multiplex as a screening tool for presence of male DNA
Georgiana Gibson-Daw, Patricia Albani and Bruce McCord

It is often extremely important to rapidly screen crime scene samples and unknown individuals who may have been involved in a crime, situations where many samples may need to be run for sorting through excessive amounts of evidence or before detention of a suspect is possible. For example seized evidence potentially linked to a suspect or the determination of which blood stains present at a crime scene may be probative. To do this specially engineered enzymes3,6,14, high speed thermal cyclers (capable of running 28 cycles in under 14 minutes) and microfluidic chip based electrophoresis4,5,9,10,15 will be implemented to process a specific designed YSTR multiplex. The goal is to reduce the analysis time to under 25 minutes. The results of this study demonstrates the application of rapid direct PCR for the analysis of YSTRs for evidence screening. Therefore the process utilizes a small set of rapidly mutating YSTR loci, it can also provide useful preliminary data on the presence of male DNA for use in suspect identification.

Direct Ultra-Trace Analysis of 5 Estrogenic Endocrine Disruptors and Bisphenol A from Whole Milk with Fabric Phase Sorptive Extraction
Rodolfo Mesa, BSc, Abuzar Kabir and Kenneth G. Furton

The advantages of fabric phase sorptive extraction (FPSE) in preparing forensic samples of whole milk for screening the presence of five estrogenic endocrine disruptors (EDCs) and bisphenol A (BPA) through chromatographic analysis are presented herein. Milk is

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an essential source of nutrition worldwide for all mammals, including humans. Due to the complexity of milk as a sample matrix for chemical analysis, the importance of screening and analyzing the presence of illicit/regulated substances to ensure food safety and quality without any matrix modification cannot be overstated. However, all commercially available sample preparation techniques require pretreatment, most notably protein precipitation and defatting. The advantages of FPSE for direct extraction of target analyte(s) from unaltered sample matrix are illustrated by a comparing classical approaches that utilize protein precipitation and defatting with FPSE that allows total elimination of this step. These compounds had never been successfully extracted from whole milk without matrix pretreatment.

**Comparison of extraction methods from cotton swabs in reference to background DNA from commonly touched surfaces**

*Meghan Roig, Thais Simoes, Bruce McCord and Kerry Opel*

In this project, various surfaces were swabbed with a damp cotton swab, including bathroom door handles, benches, public areas, and household items. The DNA was extracted using standard phenol chloroform extraction along with alkaline lysis and pressure cycling technology. A variety of different conditions were examined and optimized. For the PCT extractions, temperature, pressure, and time were investigated to increase the quantity of DNA resulting from the touched surfaces. Alkaline lysis methods were also examined to improve recovery of DNA from swabs. This procedure was optimized by determining the effect of time and temperature on the recovered DNA. The quantity of recovered DNA was determined using real time PCR with Alu based targets and SYBR green detection. The samples were also analyzed using capillary electrophoresis based STR typing to determine the percentage of recoverable alleles. Results will be shown from a variety of surfaces found in public and private areas.

**Fabric Phase Sorptive Extraction: An Indispensable Tool for Food Forensics**

*Rayma Blanco, Rodolfo Mesa, Abuzar Kabir and Kenneth G. Furton*

Food samples are often too complex and present enormous challenge to the analyst if the presence or absence of an illicit/regulated analyte(s) in the food sample matrix is of concern. Conventional sample preparation techniques including solid phase extraction (SPE), stir bar sorptive extraction (SBSE) and their different offshoots are time consuming, laborious, and multi-steps. They also require sample pretreatment processes such as filtration, protein precipitation etc. Fabric phase sorptive extraction (FPSE), for the first time, offered a novel, green and robust sample preparation approach that substantially simplifies the entire sample preparation protocol, totally eliminates sample pretreatment processes as well as post-treatment processes such as solvent evaporation and sample reconstitution. As such, FPSE, as a new generation sample preparation technique, fits perfectly with the stringent criteria set forth to withstand the scrutiny of the court of law. A number of recent applications of FPSE in food samples will be presented. Key Words: Food forensics; FPSE; Forensic sample preparation.

**Statistical Confidence Limits For A Prediction Of Carrion Insect Age, And Minimum Postmortem Interval, Based On A Categorical Response Variable**

*Lynn R. LaMotte, Amanda Roe, Jeffrey Wells and Leon Higley*

Forensic entomologists usually estimate the age of an insect. Under some circumstances this equals a minimum postmortem interval. Some analysts prefer to consider only insect life stage because size varies with specimen preservation method. Unfortunately no probabilistic model has been proposed for categorical variables such as life stage. We show how carrion insect succession analysis can be applied to categorical insect development data. The data were from 4902 Lucilia sericata specimens reared from 12.5°C to 32.5°C. Specimens were binned into age ranges varying not more than 6% in accumulated degree hours. Cross-validation analysis, in which the age of every specimen was estimated using an age-prediction model compiled without that datum, produced a 95% confidence interval containing the true age for more than 95% of the specimens. This method is easy to implement in practice. The confidence interval is determined by simply consulting a table, with no calculation required.

**Development of Paper Microfluidic Devices for the Detection of Low-Explosives Residue**

*Katherine Chabaud and Bruce McCord*

In this project, colorimetric tests are implemented on paper microfluidic devices permitting metallic residues from low explosive devices to be detected in the field. Residue from flash powders based explosive devices typically consists of inorganic salts resulting from the rapid deflagration of mixtures of inorganic oxidizers and metallic fuels. We are currently developing a paper microfluidic device for metals. Barium is detected via a buffered mixture of sodium rhodizonate, aluminum is confirmed via aluminon and ammonium acetate, iron is detected via p-aminophenol, and zinc is detected with dithizone. These devices are currently undergoing development.
validation to measure the reproducibility, stability, and sensitivity of the analysis. The paper-based devices should prove useful in the analysis of low explosive residue, as the chip is compact, and minimal time is needed to produce results. The ultimate goal of the project is to design and test a series of these devices for the presumptive detection of a variety of explosives residues in the field.

**Detecting the presence of ignitable liquids and residues in suspected arson cases by capillary microextraction of volatiles (CMV)**

Joshua DeBord, Natasha Krietals and Jose R. Almirall

A novel capillary microextraction device was used to capture the volatile organic compounds (VOCs) in the headspace above simulated fire debris samples. The headspace was dynamically sampled (< 5 minutes) through the glass capillary (measuring 2 cm in length and 2 mm diameter) that is loaded with sheets of polymeric matrix bonded onto glass microfibers to absorb/adsorb the VOC analytes of interest. The capillary is then inserted into the injection port of a gas chromatograph for thermal desorption of the VOCs directly into the column. The CMV provides exhaustive extraction of ng amounts of VOCs with relatively high breakthrough volumes (> 2 L sampling). The ease of sampling and the lack of chemical preparation make this an attractive alternative to other methods for the detection and characterization of ignitable liquid residues. The CMV extraction method is amenable to field sampling at suspected arson scenes prior to transport and analysis in the laboratory. We report, for the first time, the characterization of a standard ignitable liquid matrix using the same conditions and concentrations set forth in ASTM methods E1386-15, E1412-12 and E1413-13 using the CMV sampling system.

**Evaluation of Capillary Microextraction of Volatiles (CMV) for the analysis of hazardous air contaminants by GC-MS**

Anamary Tarifa and Jose R. Almirall

A novel field sampling device is described for the rapid detection and quantitation of VOCs from air. The CMV is an inexpensive, dynamic preconcentration technique that provides fast sampling time (<2 min) with high-efficiency and sensitivity. Coupling of the CMV with GC-MS is simple through the installation of a thermal separation probe allowing direct introduction into the GC injection port. An analytical method is presented for the detection of 17 compounds commonly found in polluted environments including the BTEX compounds. Applicability of the method for air quality control monitoring of VOCs is demonstrated using the criteria established by the EPA for sorbent tube sampling (EPA TO-17). Experimental results with standard compounds yield absolute mass method detection limits ranging from 2.0-4.6 ng for the target compounds in a 2 L air sample. The headspace calibration curves show good linearity of R²>0.95 for the target compounds, thus demonstrating the quantitation capabilities of the CMV. The majority of the compounds show good precision for headspace extraction of 4-38% (%RSD), and an extraction efficiency of 1.2-26% and breakthrough of <46% at the sampling volume (2L).

**Expanded High Resolution MS/MS Spectral Library and Compound Database for the Detection of Designer Drugs by LC-QTOF-MS**

Melanie Eckberg, Luis E. Arroyo and Anthony P. DeCaprio

The purpose of this project was to develop a high resolution MS/MS spectral library and compound database that contains designer drugs from multiple drug classes using LC-QTOF-MS instrumentation which enables the collection of high resolution, high mass accuracy spectral data. The MS/MS library and compound database contained information for over 750 designer drugs and related compounds including each compound name, chemical formula, monoisotopic mass, chemical structure, IUPAC name, CAS and ChemSpider numbers (if available), and MS/MS spectral data collected at three different collision energies (10, 20, and 40 eV). This library and database is currently being used in the screening of authentic urine specimens obtained from a private drug testing facility to detect designer drugs that may have been missed during the original screen. The combination of high resolution MS/MS library and compound database could be useful for the identification of designer drugs in screening applications of forensic toxicology.

**Triggered MRM Database for the Comprehensive Detection of Novel Psychoactive Substances by Lc-QqQ-MS**

Ashley N. Kimble, Luis E. Arroyo and Anthony P. Decaprio

The goal of this project was to create a comprehensive tMRM database for 750+ novel psychoactive substances from multiple drug classes using LC-QqQ-MS instrumentation. A second aim was to screen authentic urines collected from subjects in drug treatment programs to determine prevalence of designer and other drug use in this cohort. Only precursor-product transitions with peak intensity above 1000 counts were included in this database. Approximately 45% of all compounds analyzed showed 10 precursor-product ion transitions above 1000 counts. These findings will be able to assist in screening by LC-QqQ-MS and expand on the existing tMRM database. The expanded tMRM dataset is being employed in ongoing screening of ~1000 authentic urine specimens from subjects in ongoing screening.
drug treatment programs. The current expanded database includes 750+ novel psychoactive substances, metabolites, and associated compounds. The comprehensive tMRM spectral dataset can be beneficial to the identification of novel psychoactive substances in forensic toxicology screening.

**Field Analysis of alpha-PVP (Flakka)**
Carolina Brea and Jose Almirall

South Florida has long been an epicenter for the nation’s drug craze most recently related to the emergence of synthetic drugs. One of the most popular and equally dangerous drugs on the streets of South Florida is alpha-pyrrolidinopentiophenone (alpha-PVP), commonly known on the street as Flakka. Flakka, like many synthetic drugs, is difficult to detect in the field. We present the history and current status of Flakka using local news reporting, by interviewing the local law enforcement and forensic science sources. The rapid detection and separation of synthetic drugs will also be investigated using Ion Mobility Spectrometry, portable Ion Trap Mobility Spectrometry (ITMS), and Gas Chromatography Mass Spectrometry. We report a method for the rapid analysis of mixtures of α-PVP and similar designer drugs, ethylone and butylone, using these methods. This poster reports the use of portable ITMS as a fast, simple, and effective method for the field detection of synthetic drugs including alpha-PVP.

**Evaluation and identification of DNA methylation markers that can be used to estimate human age**
Hussain Alghanim, Joana Antunes, Deborah Silva and Bruce McCord

Recent developments in the analysis of epigenetic DNA methylation patterns has demonstrated that certain epigenetic loci show linear correlation with chronological age. It is the goal of this study to identify a set of epigenetic methylation markers for the forensic estimation of human age. Three genetic loci, SCGN, DXL5 and KLF14, were examined to identify epigenetic loci that correlate with aging. Up to 13 samples of blood and saliva were collected from volunteers with ages ranging from 18 to 72 years. DNA samples were extracted and bisulfite modified in order to distinguish between methylated and unmethylated cytosines. The DNA was next PCR amplified and the methylation level at each CpG site was quantified by pyrosequencing. Methylation patterns for the three markers, and their association with age were examined using linear regression analysis. When tested against blood, most CpG sites for the SCGN and DXL5 loci showed hypermethylation with increase in age whereas the majority of CpGs failed to display correlation with age in saliva. The results indicate that SCGN and DXL5 could be used as potential markers to estimate age using blood taken from different individuals.

**The Microwave Plasma Torch**
Ashley Windom, Michelle Miranda and Kenyon Evans-Nguyen

Ambient ionization sources developed for mass spectrometry have dramatically simplified molecular analysis. However, elemental analysis with mass spectrometry still primarily relies on complex ionization methods such as ICP. Microwave Plasma Torch (MPT) ionization has the potential to combine both molecular and elemental ionization. The current studies build on previous research using the MPT for molecular ionization, focusing on using it for elemental analysis. Elemental analysis using the MPT coupled to an ion trap mass spectrometer was characterized by building a controlled aerosol generating system. Aerosols of dissolved metals were introduced into the MPT. The influence of different parameters, such as gas flow rates, gas composition, and solution flow rates, on MPT ionization were tested using this system. These parameters changed what elements were seen and their relative intensities. The goal of these characterization studies is to move towards a fieldable MPT mass spectrometer for combined atomic and molecular analysis on-site.

**Strengthening the Evaluation and Interpretation of Glass Evidence Using Statistical Analysis of Collection Sets of Elemental Data**
Tricia Hoffman, Tatiana Trejos and Jose R. Almirall

This study evaluated the use of the equivalence test for forensic glass comparisons. The study used ICP-MS data from previously collected inter-laboratory studies and a subset of float architectural glass. The ground truth was known for these sets of glass (same source or different source) and hence the performance of each of the match criteria could be estimated using these sample sets. The equivalence test performed poorly with the data from the inter-laboratory studies and produced a Type 1 Error Rate of 100%! This study further supports the recommendation within ASTM-E2927, ASTM-E2330, and ASTM-E2926 for use to compare the elemental data derived from glass examinations.