

MAAFS 2023 - Breakout Sessions - Schedule & Abstracts

Thursday, May 18

Scholarship Winners - Preakness D

- 1:00 pm** **Horizontal and Vertical Transmission of Microbes Associated with Blow Flies of Forensic Importance**
Gabrielle Burton - Virginia Commonwealth University
- 1:30 pm** **A simple tooth preparation method for the Applied Biosystems RapidHIT ID Instrument**
Morgan Eaton, Shane Woolf, Samy Pemmasani, Tracey Dawson Green, Triniti Turner - Virginia Commonwealth University*
- 1:45 pm** **Evaluation of direct-to-amplification cell lysis techniques for forensically relevant non-sperm cells**
Rhea Arya, B.S.; Brittany C. Hudson, Ph.D., Tracey Dawson Green, Ph.D. - Virginia Commonwealth University*

Interdisciplinary Session - Preakness D

- 2:20 pm** **NIJ Forensic Science Program Updates**
Chuck Heurich - National Institute of Justice
- 2:35 pm** **Expanding the Standards Implementation Universe**
Steven Johnson - Organization of Scientific Area Committees for Forensic Science (OSAC)
- 3:05 pm** **Break**

Biology Session - Preakness D

- 3:15 pm** **Analysis of Forensic Relevant Cell Mixtures using Autofluorescence Profiling and Fluorescence Activated Cell Sorting (FACS).**
Shayla Smith and Dr. Christopher Ehrhardt - Virginia Commonwealth University*
- 3:30 pm** **Human Factors in Forensic DNA Interpretation - A series of draft recommendations from the NIST/NIJ Expert Working Group**
Tracey Johnson - National Institute of Justice
- 3:45 pm** **MD CODIS Success: It's About 'Time', Cold Case and more**
Michelle Groves - Maryland State Police Forensic Sciences Division
- 4:15 pm** **Discrimination of Monozygotic Twins Via Next-Generation Sequencing**
Cassandra Skrant, Beighley Ayers, Kelly M. Elkins - Towson University*
- 4:30 pm** **Standards & Best Practices Recommendations For Forensic Biology/DNA Testing Laboratories**
Charlotte J Word

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Chemistry Session - Triple Crown

- 3:15 pm** **NIST Mass Spectral Libraries and Resources**
Edward Erisman - NIST
- 3:30 pm** **TATP (triacetone triperoxide) Analysis using Automated Solid Phase Microextraction (SPME) with Gas Chromatography-Mass Spectrometry (GC-MS)**
Gui-hua Lisa Lang, Ryan Bain, Shane Kullen - ATF*
- 4:00 pm** **Powering Productivity: Advances in Drugs of Abuse Testing using LC-MS**
Kerry Hassell - ThermoFisher Scientific
- 4:15 pm** **GCMS Analysis of Street Drugs Utilizing Hydrogen Carrier Gas in Combination with a Hydroinert EI Source**
Kirk Lokits - Agilent Technology
- 4:45 pm** **The Full Truth: Sample Preparation for Quantitative Analysis of Opioids Present In A Population of Stamp Bags**
Emily Wilkinson - Allegheny County Office of the Medical Examiner

Physical Evidence Session - Pimlico/Laurel

- 3:15 pm** **Handwriting Black Box Study: A Review of the Criticism and Response Articles**
Linda Eisenhart and Gabe Watts - FBI Laboratory*
- 3:45 pm** **The Impact of Artificial Intelligence on Forensic Handwriting Examination**
Nancy M. Cox - NMCox Consulting
- 4:15 pm** **A "Cutting-Edge" Presentation**
Rachel Clay - Federal Bureau of Investigation
- 4:45 pm** **The Importance of Forensic Science in Science Education**
Cristy Kissel - Fort Mill High School

MAAFS 2023 - Breakout Sessions - Schedule & Abstracts

Friday, May 19th

Biology Session - Preakness D

- 9:15 am** **Using Bacteria for Vaginal Fluid Identification**
Dana Macfarlane - Thomas Jefferson University/ The Center for Forensic Science Research and Education
- 9:30 am** **An assessment of the InnoGenomics® SpermX™ method for improved separation of sperm and epithelial cell fractions using the AutoMate Express™ DNA Extraction System and PrepFiler™ Chemistry**
Justin Frye - Thomas Jefferson University / Center for Forensic Science Research and Education
- 9:45 am** **What I Learned from my agency starting a Cold Case Sexual Assault Unit**
Laura Pawlowski - Baltimore County Police Department
- 10:15 am** **Optimized Recovery of DNA and subsequent STR profiling of different tissues sampled from embalmed human cadavers**
Kofi Adjapong Afrifah - Department of Forensic Sciences, The George Washington University and Alexander Badu-Boateng - Forensic Science Laboratory, Ghana Police Service*
- 10:45 am** **Break**
- 11:00 am** **Comparison of the Qiagen EZ1 and Promega Maxwell FSC to Extract DNA from Modern Bone Samples**
Alexis Garloff - Towson University
- 11:15 am** **DNA Recovery from Burned Human Skeletal Remains: A Comparison of DNA extraction methods**
Jordan R. Brooks, Daniel Devanney, Dana D. Kollmann, Kelly M. Elkins - Towson University*
- 11:30 am** **FIGG 101: The Basics of Forensic Investigative Genetic Genealogy**
Wendy McLean, Practitioner-In-Residence with the FGG Program, University of New Haven; Claire L. Glynn, PhD, Professor and Director of the FGG Program, University of New Haven*

Chemistry Session - Triple Crown

- 9:00 am** **GCMS Analysis of Street Drugs Utilizing Nitrogen Carrier Gas in Combination with an Inert-Extractor EI Source**
Dr. Kirk E. Lokits and Alexis Willey - Agilent Technologies*
- 9:30 am** **The ever-increasing drug smuggler: Paper**
Holly Fox, BS - Cumberland County District Attorney's Office Forensic Laboratory
- 10:00 am** **How I Met Methyl Cyputylyone: The Identification Story**
Malik Naanaa - Anne Arundel County Police Department - Forensic Services Section

MAAFS 2023 - Breakout Sessions - Schedule & Abstracts

Chemistry Session - Triple Crown (continued)

- 10:15 am** **Incorporating Tetracaine as an Internal Standard for the Identification of Pharmaceutical Samples by Direct Analysis in Real Time coupled Time of Flight Mass Spectrometry (DART-TOF-MS)**
Zachary Swanekamp, Amber Burns, Catherine Savage, Dr. Michelle Peace, Dr. Stephen Raso - Virginia Commonwealth University*
- 10:45 am** **Improving the Δ 9-THC and Moisture Measurements in Forensic Laboratories by NIST Cannabis Laboratory Quality Assurance Program (CannaQAP)**
Walter Brent Wilson - NIST
- 11:15 am** **“Oh Where, Oh Where Have My Ions Gone?” – A disappearing baseline, sensitivity drop and lots of troubleshooting.**
Raquel Avelar - Anne Arundel County Police Department Forensic Services Division
- 11:30 am** **Rapid Technology Assessments (RTA): Evaluating Field Deployable Identification Systems**
Natalie Borga and Grecia Gratacós - U.S. Customs and Border Protection

Physical Evidence Session - Pimlico/Laurel

- 9:15 am** **Interview with a Counterfeiter**
Julia Barker - United States Secret Service
- 9:45 am** **Developing Latent Prints: A Fluorescent Future**
Darcy Machado - Baltimore Police Department - Forensic Science and Evidence Services Division (Forensic Processing Unit)
- 10:00 am** **Loyola’s Forensic Pattern Analysis Program Update: The First 2 Years**
Jon Fried, Rachelle Fobbs, Rana DellaRocco - Loyola University Maryland*
- 10:30 am** **Crime Scene Reconstruction Utilizing 3D Point Clouds: Aerial and Terrestrial Integrations**
Erika Harden, CSCSA & Megan Descalzi, CCSA - Baltimore Police Department Crime Scene Unit*
- 11:00 am** **Development and Implementation of a Laboratory Information Management System (LIMS)**
Ethan Conway & Kenneth Jones - Baltimore Police Department*

Scholarship Winner Abstracts

Horizontal and Vertical Transmission of Microbes Associated with Blow Flies of Forensic Importance

Gabrielle Burton - Virginia Commonwealth University

Entomological and microbiological evidence can be used in the estimation of postmortem intervals (PMI). This study observes the horizontal and vertical transmission of the microbial community associated with blowflies of forensic importance. Variable region four (V4) of the 16S ribosomal DNA (16S rDNA) was amplified and sequenced from various life stages of blow flies (n=72) using dual-index high throughput sequencing strategy on the MiSeq FGx platform. No significant difference in bacterial community structure was observed between blowfly adults with carrion access and blowfly adults with no carrion access. *Dysgonomonas*, unclassified Proteobacteria, *Escherichia*, *Ignatzschia*, *Providencia*, and *Prevotella* were the six most abundant bacterial genera associated with adult blow flies. *Lactobacillus*, *Providencia*, unclassified Enterobacteriaceae, unclassified Bacillales, and *Lactococcus* were the six most abundant bacterial genera associated with immature stages of the blowflies. This study highlights microbiomes associated with various life stages of the blow flies and its utility in decreasing error in PMI estimation based on both entomological and microbial evidence.

A simple tooth preparation method for the Applied Biosystems RapidHIT ID Instrument

Morgan Eaton, Shane Woolf, Samy Pemmasani, Tracey Dawson Green, Triniti Turner - Virginia Commonwealth University*

The Applied Biosystems RapidHIT™ ID instrument incorporates rapid DNA technology to develop a STR profile in as little as 90 minutes; however minimal research has been conducted testing the ability of the RapidHIT™ ID instrument to process tooth samples. In this study, a fast, low-tech cleaning/preparation protocol incorporating a Dremel® rotary tool and household hammer for pulverization was developed and tested on a sample set of ten deciduous teeth, which were subsequently processed on the RapidHIT™ ID instrument. Across the ten samples, the average percent of expected alleles observed was 98.47% and the average peak height across all alleles was 2461.35 RFU. These results suggest that with further testing and optimized sample preparation, the RapidHIT™ ID instrument can successfully produce STR profiles from challenged forensic samples, including teeth, using a simple, quick procedure that could be accomplished on-scene. Future studies should explore testing the above-mentioned sample preparation method on more challenged teeth samples of varying ages, with tooth pathologies, and exposed to environmental conditions.

Evaluation of direct-to-amplification cell lysis techniques for forensically relevant non-sperm cells

*Rhea Arya, B.S. *, Brittany C. Hudson, Ph.D., Tracey Dawson Green, Ph.D. - Virginia Commonwealth University*

The primary objective of this work is to explore alternative cell lysis methods for non-sperm cells that could aid in replacing the detergent and proteinase K methods traditionally used in forensic labs for differential lysis of sexual assault samples. Non-sperm samples from five different donors were lysed with six reagents (alkaline buffer, high salt stain extraction buffer, radioimmunoprecipitation assay (RIPA) buffer, digitonin buffer, urea buffer, and mammalian protein extraction reagent (M-PER™) in addition to the control protocol, prepGEM™. Quantification using Quantifiler® Trio revealed higher average DNA yield when non-sperm cells were lysed with the mammalian protein extraction reagent and lower concentrations of the alkaline buffer as compared to the control and STR profile analysis revealed acceptable mean STR peak heights. Semen and mixture samples are currently being evaluated with this, and other best-performing methods, and this data will be presented. Overall, this work provides positive preliminary results suggesting that alternative techniques for non-sperm cell lysis may be capable of quickly producing high-quality DNA for direct amplification, without purification.

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Interdisciplinary Session Abstracts

NIJ Forensic Science Program Updates

Chuck Heurich - National Institute of Justice

This presentation will summarize the current efforts of NIJ's Office of Investigative and Forensic Sciences program portfolio. The topics will include the Forensic Science Research and development programs, the Forensic Science Technology Center of Excellence, National Center for Forensics, and NamUs (National Missing and Unidentified Persons System).

Expanding the Standards Implementation Universe

Steven Johnson - Organization of Scientific Area Committees for Forensic Science (OSAC)

Since its inception in early 2014, OSAC has worked to facilitate the development and implementation of scientifically sound standards and guidelines for forensic science. Much of OSAC's focus had been on outreach to the over 400, DOJ's Bureau of Justice Statistics identified, traditional forensic science service providers (FSSPs). In early 2022, OSAC expanded its implementation efforts to smaller, "non-traditional" FSSPs as an area of focus. This presentation will provide participants with an azimuth check of the OSAC mission to date, some of the milestones achieved, some anecdotal feedback from "non-traditional" FSSPs that have joined the implementation journey and the way ahead for future standards implementation efforts.

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Biology Session Abstracts

Analysis of Forensic Relevant Cell Mixtures using Autofluorescence Profiling and Fluorescence Activated Cell Sorting (FACS)

Shayla Smith and Dr. Christopher Ehrhardt - Virginia Commonwealth University*

Determining the source tissue for DNA is an ongoing challenge, particularly for samples containing contributions from multiple individuals. To improve this, we tested a new method to rapidly characterize source tissues of contributor cell populations within a mixture and then physically separate them prior to DNA profiling. This method utilized intrinsic features of cells such as their size, shape, and autofluorescence profiles prior to signatures that are measured in a non-destructive fashion. Results showed distinct differences in size and autofluorescence profiles between cell populations derived from blood, epidermal tissue, and saliva. Furthermore, these signatures could be used to physically isolate cell populations from a two-person biological mixture sample yielding more interpretable DNA profiles compared to conventional DNA profiling.

Human Factors in Forensic DNA Interpretation - A series of draft recommendations from the NIST/NIJ Expert Working Group

Tracey Johnson - National Institute of Justice

Studying human factors is essential to inform our understanding of humans' interactions with the systems they use. This is especially important in forensic science, where the outcomes of these interactions can have a direct impact on an individual life or liberty. The National Institute of Standards and Technology (NIST)/National Institute of Justice (NIJ) Expert Working Group on Human Factors in Forensic DNA Interpretation was charged with conducting a scientific assessment on the effects of human factors in forensic DNA analysis and interpretation with the goal of recommending approaches to improve its practice and reduce the likelihood of errors. The Expert Working Group has been evaluating relevant bodies of scientific literature and technical knowledge to develop a report containing these recommendations. This evaluation serves to educate member of forensic DNA laboratories and allied criminal justice partners (e.g., attorneys, investigators, parent organization leadership) alike and includes topics related to:

- Education, Training, and Professional Credentialing
- Quality assurance/Quality control
- Cognitive Bias and Error Reduction
- Reporting and Testimony
- Management
- Work Environment
- Quantitative and Qualitative Expressions of DNA Results
- Research Needs
- Interpretation and Technology

This three-year effort follows the success of two previous reports produced in the Human Factors Expert Working Group series that investigated the role of human factors in Latent Print Examination and Forensic Handwriting Examination.

During this presentation, material will be presented that highlights key findings and presents a first look at the draft recommendations focusing on research needs, education, training and professional credentialing.

MD CODIS Success: It's About 'Time', Cold Case and more

Michelle Groves - Maryland State Police Forensic Sciences Division

Brief overview of Maryland's DNA database legislation and summary of a few cases that were solved using CODIS.

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Discrimination of Monozygotic Twins Via Next-Generation Sequencing

Cassandra Skrant, Beighley Ayers, Kelly M. Elkins - Towson University*

Monozygotic twins are difficult to differentiate in a forensic laboratory because they share identical STRs. To address this using next-generation sequencing, nine pairs of monozygotic twins have been sequenced with the ForenSeq DNA Investigator Kit on the Illumina MiSeqFGx. DNA Primer Mix B was used to sequence 27 autosomal STRs, 24 Y-STRs, 7 X-STRs, 94 identity SNPs, 22 phenotypic SNPs, and biogeographical ancestry SNPs in every monozygotic twin sample. The sequencing results were compared between the monozygotic twin pairs to determine if certain SNPs within the STR or its flanking region can be utilized for the discrimination of monozygotic twins.

Standards & Best Practices Recommendations For Forensic Biology/DNA Testing Laboratories

Charlotte J Word

Seventeen Standards and Best Practice Recommendations, regarding various aspects of serological and DNA testing, are currently available on the website of the Organization of Scientific Area Committees for Forensic Science (OSAC) for implementation by forensic Biology and DNA testing laboratories. Several additional documents available for implementation in laboratories have been published as ANSI/ASB Standards and Best Practice Recommendations after completing the standard development process with the American Academy of Forensic Sciences (AAFS) Standards Board (ASB).

An overview of all of the available documents and those coming out in the future will be presented along with information detailing the processes involved and how to access the various documents. Resources available for aiding laboratories with implementation of the documents and the assessment of implementation will be provided along with information regarding how to get involved with drafting or developing new documents.

Using Bacteria for Vaginal Fluid Identification

Dana Macfarlane - Thomas Jefferson University/ The Center for Forensic Science Research and Education*

It is challenging to identify vaginal fluid due to its complexity, inter and intra-variability, as well as its similarity with other body fluids. The vaginal microbiome, however, is unique compared to other body environments and thus could be used to determine origin of a fluid. Using Nanopore sequencing technology and the 16S bacterial genome region, this research shows how the vaginal bacterial species and concentrations could be used to identify vaginal fluid in individual samples and mixtures.

An assessment of the InnoGenomics® SpermX™ method for improved separation of sperm and epithelial cell fractions using the AutoMate Express™ DNA Extraction System and PrepFiler™ Chemistry

Justin Frye - Thomas Jefferson University / Center for Forensic Science Research and Education

SpermXTM is a differential extraction method that uses a polymer membrane to trap and separate sperm cells from epithelial cells. Samples processed through the SpermXTM method require purification prior to DNA quantitation. Previously, the SpermXTM method was determined to be compatible with the EZ1® Advanced XL. This research focuses on evaluating the performance and compatibility of the SpermXTM method with the AutoMate Express™ DNA Extraction System and PrepFiler™ Chemistry commonly used for DNA purification.

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What I Learned from my agency starting a Cold Case Sexual Assault Unit

Laura Pawlowski - Baltimore County Police Department

The Baltimore County Police Department has re-worked every part of their approach to sexual assault cases. I will show how our evidence storage, tracking, evaluation of cases and testing procedures have been updated to be more centered around survivors of sexual crimes. We utilized several types of grant funding and built a multi-disciplinary approach to case management. A dedicated cold case team was also developed. I will discuss our testing strategy and how the lab has handled the changes and increase in casework. The lab hit several roadblocks and had to make changes to our procedures. Baltimore County is unique in that the hospital that houses our SAFE nurse program also has a substantial amount of sexual assault case evidence (slides) from 1970s-1990s stored. The logistics of this type of evidence has been a particular challenge. Finally, I will show the results of our testing and what our next phase of the project will be.

Optimized Recovery of DNA and subsequent STR profiling of different tissues sampled from embalmed human cadavers

Kofi Adjapong Afrifah - Department of Forensic Sciences, The George Washington University, Washington, D.C. and Alexander Badu-Boateng - Forensic Science Laboratory, Ghana Police Service, Accra, Ghana*

Storage of specimens sampled from human remains for pathological testing, embalming for burial purposes, and for human identification often requires formalin fixation and/or paraffin embedding. Current knowledge in molecular biology techniques and forensic DNA analysis makes it possible to optimize the extraction of amplifiable DNA from formalin-fixed tissues by improving the pre-treatment, optimizing the digestion condition of proteinase K, simplifying the extraction protocol and purifying the extracted DNA with optimized volumes of alcohol. Brain, cartilage and bone marrow samples were taken from four different cadavers at autopsy at the Ghana Police Hospital mortuary in Accra, Ghana sixty-two days after embalming. Our optimized protocol yielded detectable quantities of DNA from the samples when quantified with the 7500 Real-Time PCR equipment. The optimized protocol reduced the concentration of formalin fixation residues in extracted DNA from formalin-fixed tissues, thereby improving the amplification efficiency for STR profiling.

Comparison of the Qiagen EZ1 and Promega Maxwell FSC to Extract DNA from Modern Bone Samples

Alexis Garloff - Towson University

The Towson University Forensic Anthropology Laboratory defleashes donated human remains for educational and research purposes. This research sought to ensure the process did not introduce analyst or environmental DNA that would contaminate the specimen's DNA. DNA extraction was performed using the Qiagen EZ1 Extraction Robot and the Promega Maxwell FSC. Both extraction methods yielded quantifiable DNA from the bone samples. For the bone samples extracted using the Qiagen EZ1, full profiles were generated. Partial profiles were generated from the Promega Maxwell FSC extracts. This research demonstrated that single source profiles were generated from the bone of donated human remains, following the defleshing process.

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DNA Recovery from Burned Human Skeletal Remains: A Comparison of DNA extraction methods

Jordan R. Brooks, Daniel Devanney, Dana D. Kollmann, Kelly M. Elkins - Towson University*

Accurately identifying someone whose body has been burned can be difficult. The presence of tissues, teeth, and a face can make this task easier for investigators. However, when these items are absent, investigators must rely on any skeletal remains that may be present. Skeletal remains contain essential information related to the identification of an individual. Aside from being able to give clues as to the victim's case of death and age and sex, a genetic profile could be obtained using hard tissue DNA. Remains can be beneficial in cases of a mass disaster, homicides in which fire was used to mask the victim's identity, and unidentified victims. Extracting DNA from bone comes with its challenges, yet, having to work with bone that has been altered proves to be even more challenging. Thus, it is essential to know which methods of DNA extraction yield the highest DNA when dealing with DNA recovery from burned human skeletal remains. The methods of DNA extraction used in this study were Maxwell, EZ1, and manual extraction using the Qiagen DNA Investigator kit. Based on amplification results obtained, the EZ1 extraction method produced the highest quantification values for our burned bone samples. In order to determine the quality of the DNA profile from these burned skeletal remains capillary electrophoresis was used for STR typing.

FIGG 101: The Basics of Forensic Investigative Genetic Genealogy

Wendy McLean, Practitioner-In-Residence with the FGG Program, University of New Haven; Claire L. Glynn, PhD, Professor and Director of the FGG Program, University of New Haven*

Forensic Investigative Genetic Genealogy was first used as an investigatory tool in 2018. Since then it has been used in hundreds of cases to identify unknown remains and perpetrators of violent crimes. This session will discuss the basic workflow, and the importance of adherence to scientific and legal standards.

Chemistry Session Abstracts

NIST Mass Spectral Libraries and Resources

Edward Erisman - NIST

The NIST Mass Spectrometry Data Center maintains the NIST mass spectral libraries and provides free mass spectrometry software. This talk will go over the tools available and information about updates to the libraries. The 2023 release of the EI mass spectral library contains spectra for 347,100 compounds and retention index values for 177,828 compounds. The 2023 release of the tandem library contains 2.3 million spectra from 51,000 compounds. NIST provides software for EI mass spectral extraction, searching, and interpretation.

TATP (triacetone triperoxide) Analysis using Automated Solid Phase Microextraction (SPME) with Gas Chromatography-Mass Spectrometry (GC-MS)

Gui-hua Lisa Lang, Ryan Bain, Shane Kullen - ATF

TATP is the most “famous” newcomer in the world of explosives in recent years. It is a primary explosive that was first discovered in 1895 by the German chemist Richard Wolfenstein. TATP is very easy to make with readily available ingredients from household products, so it became the “go-to” explosive terrorists used in improvised detonators. TATP has been extensively studied and researched over the years with various techniques. GC-MS with electron ionization is a simple and efficient technique to analyze intact TATP samples; however, post-blast evidence poses challenges in casework. The ATF Forensic Science Laboratory recently conducted a series of studies with TATP samples and developed an automated SPME method to successfully detect both intact and post-blast TATP. The results of the method development and TATP case studies will be presented.

Powering Productivity: Advances in Drugs of Abuse Testing using LC-MS

Kerry Hassell - ThermoFisher Scientific

Drugs of abuse testing in urine is an essential and routine requirement for forensic labs. With the ever-growing number of abuse drugs and increase in overdoses, it is necessary to not only detect but also confirm and quantitate a wide range of analytes with a high level of confidence. Because of this, it is of great importance to develop a fast and high-throughput liquid chromatography mass spectrometry (LC-MS/MS) method that can accommodate many drugs of different hydrophilicities, chemical structures, and produce baseline separation of isomers. Here we present a method for quantitative analysis of 106 drugs of abuse in urine with a complete SPE sample preparation workflow and a fast, 7-minute LC-MS/MS method using the Thermo Scientific™ Orbitrap Exploris™ 120 Mass Spectrometer. Compounds were identified based on fragment ions, isotopic pattern, and retention times and calibration curves ranging from as low as 0.05 ng/mL for some analytes to 5,000 ng/mL were produced.

GCMS Analysis of Street Drugs Utilizing Hydrogen Carrier Gas in Combination with a Hydroinert EI Source

Kirk Lokits - Agilent Technology

The purpose of this research is to demonstrate that several recent advances in inert coatings on the mass spec source assembly, found in the Agilent Technologies Hydroinert™ Source, can be successfully incorporated into utilizing hydrogen as an alternative carrier gas in the current screening methods involving street drug samples. This work seeks to demonstrate the improvements in source reactivity, increases in analyte response, spectral fidelity, and speed of analysis when using the Hydroinert™ source in combination with hydrogen as the carrier gas.

The Full Truth: Sample Preparation for Quantitative Analysis of Opioids Present In A Population of Stamp Bags

Emily Wilkinson - Allegheny County Office of the Medical Examiner

A full brick of stamp bags retained from a street seizure was qualitatively and quantitatively analyzed using a validated qualitative method for casework and an approved research-only quantitative method. The goal was to first assess if the qualitative contents were consistent amongst the bags via hypergeometric sampling, and to assess the difference in compound of interest concentration in each bag (all stamp bags were sampled consistently by one Scientist). Evaluations of average percentages amongst each bag and comparisons of each bags' average to the overall average were assessed. Lastly, the powder from all stamp bags was able to be combined, which is a step not routinely employed or accepted in casework, for additional quantitative analysis comparisons.

GCMS Analysis of Street Drugs Utilizing Nitrogen Carrier Gas in Combination with an Inert-Extractor EI Source

Dr. Kirk E. Lokits and Alexis Willey - Agilent Technologies*

The purpose of this research is to demonstrate that changes in conventional column configurations and very low flow, can be successfully incorporated into utilizing nitrogen as an alternative carrier gas in the current screening methods involving street drug samples. This work seeks to demonstrate peak resolution commonly found in street drug samples, ability to tune and maintain a mean-free-ion path, and spectral fidelity, when using the Inert-Extractor source in combination with nitrogen as the carrier gas. This study applied Method Translation software to convert a conventional street drug screening method without changing peak elution patterns or negatively affecting peak resolution.

The ever-increasing drug smuggler: Paper

Holly Fox, BS - Cumberland County District Attorney's Office Forensic Laboratory

Paper isn't a common type of evidence submission in a seized drug lab. However, it is one of the main forms of drug transportation in correction institutions. Common forms of street drugs, such as powders, pills, and plant material, are not what's routinely seized in these facilities. Instead, notes, legal mail, magazines, and photo albums hold the drugs that are smuggled inside. The majority of the paper submitted is unstained, which can make sampling a challenge. Case approach, sampling, instrumentation, and the various substances identified will be discussed.

How I Met Methyl Cypuylone: The Identification Story

Malik Naanaa - Anne Arundel County Police Department - Forensic Services Section

Methyl Cypuylone (N-Cyclohexyl Butylone) is a synthetic cathinone that was first seen by the Anne Arundel County Police Department - Forensic Services Section as early as December 2021. At that time, little information was known about Methyl Cypuylone, therefore it was unable to be reported in this case. Since then, at least 4 other laboratories within the United States have seen this substance in casework. This presentation will focus briefly on characterizing Methyl Cypuylone, as well as the steps we took to attempt to identify this unknown in casework.

Incorporating Tetracaine as an Internal Standard for the Identification of Pharmaceutical Samples by Direct Analysis in Real Time coupled Time of Flight Mass Spectrometry (DART-TOF-MS)

Zachary Swanekamp, Amber Burns, Catherine Savage, Dr. Michelle Peace, Dr. Stephen Raso - Virginia Commonwealth University*

Due to the similarities in visual appearance of many illicit pharmaceutical samples and their legitimate pharmaceutical preparations as well as the emerging complexities in the drug landscape, an accurate and rapid confirmation tool is required for the identification of the active ingredient(s) in pharmaceutical samples. The incorporation of tetracaine as an internal standard was investigated for the confirmation of samples using a Direct Analysis in Real Time coupled Time of Flight Mass Spectrometer (DART-TOF-MS). The lower limit of detection for the method was established. The selectivity of this method was evaluated by comparing drugs with identical molecular masses using in-source collision induced dissociation (is-CID) fragmentation and principal component analysis (PCA) was used to differentiate spectra of drugs with identical mass and Multivariate Analysis of Variance (MANOVA) was performed to assess significance. Mass assignment inter-day and intra-day reproducibility test were performed on the DART-TOF-MS spectra and box plots of the reproducibility data were made, and Analysis of Variance (ANOVA) was performed to assess significance. Finally, the results of this technique were compared to gas chromatography coupled mass spectrometry (GC-MS), an established analytical protocol, to assess the viability of DART-TOF-MS as a confirmation tool in pharmaceutical analysis. This study determined that incorporating tetracaine as an internal standard did not significantly affect the DART-TOF-MS spectra and the ability to differentiate and identify controlled substances in pharmaceutical samples.

Improving the Δ 9-THC and Moisture Measurements in Forensic Laboratories by NIST Cannabis Laboratory Quality Assurance Program (CannaQAP)

Walter Brent Wilson - NIST

The National Institute of Standards and Technology established a Cannabis Laboratory Quality Assurance Program (CannaQAP) to help ensure the quality of routine analysis in forensic laboratories through a series of interlaboratory comparison studies. To date, CannaQAP has completed three sets of comparisons with over 200 participants focusing on the determination of cannabinoids Δ 9-THC, THCA (the acidic precursor of Δ 9-THC), total Δ 9-THC, and moisture in Cannabis plants and/or oils. These studies are designed to allow forensic laboratories to demonstrate the accuracy and precision of their analytical methods and ability of their forensic scientists. This presentation will reveal the overall performance of forensic and cannabis testing laboratories in the three exercises. Data will be presented comparing the participants results with NIST results obtained by liquid chromatography with either a photodiode array detector and/or tandem mass spectrometry.

“Oh Where, Oh Where Have My Ions Gone?” – A disappearing baseline, sensitivity drop and lots of troubleshooting.

Raquel Avelar - Anne Arundel County Police Department Forensic Services Division

In October 2022, we noticed an intermittent baseline drop in our Gas Chromatograph Total Ion Chromatograms and a drop in overall ion sensitivity for our mass spectrums in our 7890B/5977A GC/MSD. Simple inlet maintenance as well as source and inlet cleanings were performed several times as the issue seemed to come and go with no explanation. The troubleshooting steps performed over the next four months by the vendor and chemists are discussed and reviewed.

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Rapid Technology Assessments (RTA): Evaluating Field Deployable Identification Systems

Natalie Borga and Grecia Gratacós - U.S. Customs and Border Protection

The mission of U.S. Customs and Border Protection (CBP) is to protect the American people, safeguard our borders, and enhance the nation's economic prosperity. In support of mission objectives, Laboratories and Scientific Services (LSS), the scientific division of CBP, aims to provide rapid, accurate, and reliable forensic and scientific services, to include Rapid Technology Assessments (RTAs) of equipment for these frontline counternarcotics operations. During FY2022 a total of eight (8) chemical detection RTAs, focusing on Raman, FTIR, GC/MS, and ion mobility technologies were conducted. This overview will detail the process from initial concept development through final reports and the technology assessment catalog to evaluate portable field technologies that are vital for providing on-site presumptive identifications of potential threats entering the country.

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Physical Evidence Session Abstracts

Handwriting Black Box Study: A Review of the Criticism and Response Articles

Linda Eisenhart and Gabe Watts - FBI Laboratory*

In August 2022, the Proceedings of the National Academy of Sciences (PNAS) published the results of the FBI's 5-year handwriting black box study in an article titled "Accuracy and reliability of forensic handwriting comparisons." In December 2022, the PNAS published a criticism of that article titled "On the (mis)calculation of forensic science error rates" by Dr. Jeff Kukucka, and a subsequent response by many of the original handwriting black box study authors titled "Reply to Kukucka: Calculating error rates in forensic handwriting examiner decisions." This presentation will walk through each of the points raised by Dr. Kukucka and the parallel response, as well as some of the supporting materials cited by the authors. Attendees will be given time to discuss these topics and presenters will ensure time for Q&A.

The Impact of Artificial Intelligence on Forensic Handwriting Examination

Nancy M. Cox - NMCox Consulting

Advancements in Artificial Intelligence have had a significant global impact. This presentation will highlight the ascent of synthetic handwriting and the impact that may have on forensic handwriting examination. Examples of synthetic writings will be provided to highlight examiner limitations and provide recommendations for handwriting examiners.

A "Cutting-Edge" Presentation

Rachel Clay - Federal Bureau of Investigation

Investigators and suspects alike often don't realize the forensic value of a cut-edge on a questioned paper item. See the methods used to perform a cut-edge comparison and see how this type of comparison can provide a forensic link between a questioned and known item in the review of two FBI cases where cut-edge comparisons were conducted.

The Importance of Forensic Science in Science Education

Cristy Kissel - Fort Mill High School

Forensic Science is a growing science course in secondary schools across the country. This course offers hands-on real world experiences for students to study biology, chemistry and physics and build critical thinking and problem solving skills needed in the 21st century workplace. Over the last several years students enrolled in natural science college programs have declined; however courses such as forensic science has created a resurgence in science interest at the secondary school level. This presentation will discuss ways forensic scientists and laboratories can support these new programs and encourage students' interests in science.

Interview with a Counterfeiter

Julia Barker - United States Secret Service

Why does a counterfeiter simulate certain banknote security features? This presentation will cover the simulation of security features in U.S. currency along with the perspective of a counterfeiter responsible for manufacturing and successfully passing hundreds of thousands of dollars.

MAAFS 2023 - Breakout Sessions - Schedule & Abstracts

Developing Latent Prints: A Fluorescent Future

Darcy Machado - Baltimore Police Department - Forensic Science and Evidence Services Division (Forensic Processing Unit)

For many years, the standard for developing latent prints has been black powder or cyanoacrylate fuming followed by black powder and preserving the ridge detail on a lift card. Unfortunately, the powdering method does not provide optimal contrast; especially, when the evidence is dark in color. Moving forward with fluorescent methods, in latent print processing, increases the contrast between ridge detail and the background which, consequently, increases the chance of recovery. Additionally, utilizing 1:1 photography provides increased reliability in ridge detail preservation when compared to the lift card alternative. This presentation will canvass currently used powdering methods, cyanoacrylate fuming, an overview of fluorescent methods available to replace black powder, the pros and cons of all techniques and methods discussed, and an outline of validation steps needed to put a laboratory on the right track for moving towards a fluorescent future.

Loyola's Forensic Pattern Analysis Program Update: The First 2 Years

Jon Fried, Rachelle Fobbs, Rana DellaRocco - Loyola University Maryland*

Details of the Forensic Pattern Analysis master's program, which launched in Fall of 2021, were presented at the 2022 MAAFS Annual Meeting. As the first students prepare to graduate, this presentation will showcase the successes and challenges that the FPA Program has experienced. The positive impact to the training plan for new latent fingerprint examiners will be highlighted, via perspectives from Baltimore Police Department's Rana DellaRocco, Chief of Forensic Science and Evidence Services, and Rachelle Fobbs, Latent Fingerprint Unit Supervisor, who are also instructors in Loyola's program. New course offerings, support from additional local agencies, and other elements of the program's growth, will also be discussed.

Crime Scene Reconstruction Utilizing 3D Point Clouds: Aerial and Terrestrial Integrations

Erika Harden, CSCSA & Megan Descalzi, CCSA - Baltimore Police Department Crime Scene Unit*

The Baltimore Police Dept. instituted FARO Focus laser scanners for crime scene documentation on homicide scenes in 2022. The scanners were validated in compliance with ANAB ISO 17025 accreditation requirements prior to being integrated into casework documentation. This presentation will go through the validation process of the scanner, as well as what the future of 3D documentation will look like within the department. This future includes the use of sUAS systems (drones) for documentation, and the integration of point cloud data taken from aerial and terrestrial perspectives.

Development and Implementation of a Laboratory Information Management System (LIMS)

Ethan Conway & Kenneth Jones - Baltimore Police Department*

In late 2020, the Baltimore Police Department's Forensic Laboratory began development on a new LIMS that would unify the laboratory under a single system and replace the compartmentalized system of spreadsheets, unit specific databases, and paper worksheets in use at the time. Over the next two years, management and unit subject matter experts would design, build, test, and implement a comprehensive system to work, track, and report all laboratory evidence and requests for analysis. This presentation will cover the development and Implementation of JusticeTrax's version 5 Laboratory Information Management System and discuss how to manage a large-scale project for your laboratory.