

MAAFS 2023 - Poster Session

Wednesday, May 17 - 2:00 pm - 4:00 pm - Preakness A/B/C

- P1 A Fluorescent Enhancement Method for Footwear Impressions in Ice Melt Products**
Abigail Thompson - Cedar Crest College
- P2 Can Neurodegenerative Disease be Revealed through NGS for Forensic DNA Typing?**
Noelle Neff, B.S. and Kelly M. Elkins Ph.D. - Towson University*
- P3 A Method Development for Detecting Vaginal Fluid and Menstrual Blood Utilizing and Assessing Commercially Available ELISA Kits**
Ezra Goldstein, Grace Cieri, Leah Nangeroni - Thomas Jefferson University*
- P4 Impact of Mouthwash on Microbiome Associated with Human Saliva and its Implication for a Bacterial Signature Based Body Fluid Identification Method**
Grace Cavanaugh - Virginia Commonwealth University
- P5 Examining common weed species' morphological and physiological response to nutrients provided by decomposing carrion in various soil types**
Dr. Maren Veatch-Blohm and Martin MacStudy - Loyola University Maryland*
- P6 Determination of wound colonization by larvae of Calliphora vicina**
Lily Mead, Maddie Wilson, Dr. David Rivers - Loyola University Maryland*
- P7 Comparison of Human Perception versus ΔE for the Marquis Presumptive Test Producing a Yellow Product**
Haylie Browning, Dr. Jeanne Berk, Ph.D., Dr. Audrey Ettinger, Ph.D. - Cedar Crest College*
- P8 The Evaluation of the Effects of Personal Lubricants Including Spermicide on Seminal Fluid Immunoassays (ABACard® p30, RSID™ Semen, and SERATEC® PSA, BLUESTAR® IDENTI-PSA®)**
Megan Jeffries - Thomas Jefferson University
- P9 Development and Validation of MicroRNA Markers for Forensic Body Fluid Identification Using Rt-qPCR**
Jane Goble - Virginia Commonwealth University
- P10 Differentiation of smokers and non-smokers by DNA methylation and PCR high resolution melt**
Jalyn Mullens, B.S and Kelly M. Elkins, Ph.D. - Towson University*
- P11 An Evaluation and Comparison Study of Two Rapid Y-Screen Assays for the Analysis of Sexual Assault Evidence Kits**
Shameena Franklin - Thomas Jefferson University / Center for Forensic Science Research and Education
- P12 Relationship of DRE categories to the laboratory results in State of Maryland cases**
Ying Ren, M.D., Ph.D., Yale Caplan, Ph.D. - Maryland State Police*

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- P13 Evaluating the Performance of Modern X-Ray Fluorescence Spectrometry Systems for the Forensic Analysis of Glass**
Ruthmara Corzo, Troy Ernst, Joseph Insana, and Tatiana Trejos - National Institute of Standards and Technology*
- P14 The Stephan Cowans Wrongful Conviction: Cognitive Biases and Structural Quality Assurance Issues**
Justine Hayward BS, John Morgan PhD - Loyola University Maryland
- P15 Becoming a Trained Serologist in 45 minutes: Developing a Serology Field Trip Experience for Middle School and High School Students**
Leah Nangeroni - The Center for Forensic Science Research and Education

Biology Posters

(P4) Impact of Mouthwash on Microbiome Associated with Human Saliva and its Implication for a Bacterial Signature Based Body Fluid Identification Method

Grace Cavanaugh - Virginia Commonwealth University

Body fluid identification (BFID) plays a crucial role in criminal investigation, where a majority of currently used methods are presumptive with the exception of few confirmatory tests. The bacterial signature-based method is a promising new BFID method but it needs several validation studies, such as this study, which determines how mouthwash may affect the ability of forensic scientists to identify saliva on swabs and other physical evidence using the bacterial signature-based BFID method. Saliva swab samples were collected immediately before and after the use of mouthwash, two hours, eight hours, and 24 hours after the use of mouthwash from ten human subjects (n=50). Bacterial DNA was extracted from the swabs using the QIAgen DNA Investigator Kit, and was quantified using an in-house quantitative PCR (qPCR) method. Variable region four (V4) of the 16S rDNA was amplified and sequenced using a dual-index high throughput sequencing strategy on the MiSeq FGx sequencing platform. The mouthwash didn't significantly change bacteria associated with saliva samples; the top five genera associated with saliva samples (both before and after the use of mouthwash) were Streptococcus, Rothia, Haemophilus, Veillonella, and Gemella. Results from this study indicate that bacterial signature-based identification of saliva samples will work with the same accuracy whether swabs were collected before or after the use of commercial mouthwash brands.

(P11) An Evaluation and Comparison Study of Two Rapid Y-Screen Assays for the Analysis of Sexual Assault Evidence Kits

Shameena Franklin - Thomas Jefferson University / Center for Forensic Science Research and Education

Sexual Assault evidence kits are evidentiary items and swabs collected from victims of sexual assault, to be tested by forensic scientists for the presence of the perpetrators DNA. Due to a growing collection of SAEKs and limitations in personnel, funding, and efficiency, law enforcement in the United States have to contend with a massive SAEK backlog, with turnaround times of over one year. This research study aims alleviate this issue by evaluating and comparing two available rapid Y-screen assays designed as cost-effective ways to quickly test for the presence of male DNA in a SAEK. This research tests the hypothesis that The Applied Biosystems™ PrepFiler™ LySep™ Y-screen assay performs comparatively to the Promega's Casework Direct System and is at least as time-efficient, cost-efficient, and accurate when reporting the presence of male DNA. The results of this study demonstrate the importance of comparing assays that are commercially available to assist forensic scientists in decision making when it comes to adopting these tests.

(P3) A Method Development for Detecting Vaginal Fluid and Menstrual Blood Utilizing and Assessing Commercially Available ELISA Kits

Ezra Goldstein, Grace Cieri, Leah Nangeroni - Thomas Jefferson University*

The search for potential reliable markers for vaginal fluid and menstrual blood has been part of large international studies using next-gen methods such as targeted mRNA massively parallel sequencing approaches. These primary studies have identified some potential markers such as DKK4, LEFTY2, and SFRP4. In this study, their associated protein markers were run on commercially available ELISA kits to evaluate sensitivity and specificity in identifying vaginal fluid and menstrual blood. The results showcase the possibility to quickly perform a presumptive screening for these fluids despite their complexity using an ELISA serological method.

(P9) Development and Validation of MicroRNA Markers for Forensic Body Fluid Identification Using Rt-qPCR

Jane Goble - Virginia Commonwealth University

Body fluid identification (BFID) is one of the first and most important steps of the standard DNA analysis workflow, yet current serological methods for this purpose can have many issues, including high sample consumption and false results that can arise from test chemistry. The quantification of miRNAs has been suggested as an alternative method for the purpose of body fluid identification, as multiple studies have shown that miRNAs are differentially expressed in body tissues. Two miRNA targets that have shown promise for body fluid specificity in the literature were added to a previously validated prediction model, and Real-time RT-qPCR analysis was performed for all five miRNA targets of interest. Stem-loop miRNA primers for each target were designed and optimized for ideal reaction conditions using RNA extracts of forensically relevant samples, then evaluated for body fluid specificity in DNA extracts of four different body fluids of interest. Upon analysis, each miRNA target evaluated was able to produce a single amplicon with no non-specific amplification. The results indicate that the quantification of miRNAs can be used to differentiate between forensically relevant body fluids, making it an ideal method for BFID over more traditional serological methods.

(P8) The Evaluation of the Effects of Personal Lubricants Including Spermicide on Seminal Fluid Immunoassays (ABAcad® p30, RSID™ Semen, and SERATEC® PSA, BLUESTAR® IDENTI-PSA®)

Megan Jeffries - Thomas Jefferson University

This research study is to assess the effects of personal lubricants on four commercially available seminal fluid immunoassays (ABAcad® p30, RSID™ Semen, SERATEC® PSA, and BLUESTAR® IDENTI-PSA®). A side-by-side comparison of the four immunochromatographic tests will be conducted utilizing four different types of lubricants to include natural, water-based, silicone, and spermicide. The research will evaluate false positive or negative results that may occur due to lubricant components that cross-react with antibodies in the immunochromatographic tests. Seminal and vaginal fluid samples including mixtures will be tested to demonstrate samples encountered in casework.

(P10) Differentiation of smokers and non-smokers by DNA methylation and PCR high resolution melt

Jalyn Mullens, B.S and Kelly M. Elkins, Ph.D. - Towson University*

Identifying if it was a smoker or nonsmoker who contributed a fingerprint or body fluid to a crime scene can help the forensic community by excluding a large portion of the population. In this project, we extracted DNA from buccal swabs obtained from chain smokers, occasional smokers, and nonsmokers. The DNA was quantitated, bisulfite treated, and analyzed using PCR HRM. The genes CYP1A1, F2RL3, CYTL1, CYP1B1, and AHRR were probed with specifically designed primers. The results showed a difference between smokers and nonsmokers DNA methylation within the F2RL3 gene region. The F2RL3 gene was hypomethylated in smokers which resulted in the lower melting temperature of HRM results observed as compared to the nonsmokers.

(P2) Can Neurodegenerative Disease be Revealed through NGS for Forensic DNA Typing?

Noelle Neff, B.S. and Kelly M. Elkins Ph.D. - Towson University*

The forensic markers utilized for the identification of individuals were chosen, in part, because they are within noncoding regions of the genome. Recent research has indicated that forensic identity markers previously assessed as “junk” DNA, may reveal private medical information. In this study, samples from individuals diagnosed with neurodegenerative diseases were tested using the Verogen ForenSeq™ Signature Prep Kit and next generation sequencing (NGS) to examine the possible association of the diseases with five forensically relevant markers. All samples were typed and evaluated using capillary electrophoresis to determine if a profile could be generated and compared to NGS. The SNP genotype results of the neurodegenerative disease samples were compared to unaffected, apparently healthy donor samples.

Chemistry Posters

(P13) Evaluating the Performance of Modern X-Ray Fluorescence Spectrometry Systems for the Forensic Analysis of Glass

Ruthmara Corzo, Troy Ernst, Joseph Insana, and Tatiana Trejos - National Institute of Standards and Technology*

Micro X-ray Fluorescence Spectrometry (μ XRF) is frequently used for the forensic analysis of glass, following the recommendations provided in the ASTM E2926 standard test method. However, the ASTM E2926 recommendations were based on interlaboratory data collected using μ XRF instrumentation equipped with traditional lithium-doped silicon (SiLi) detectors. Recent advancements in modern μ XRF instrumentation, such as the introduction of Silicon Drift Detectors (SDDs) and high-intensity polycapillary optics, warrant the reevaluation ASTM E2926. This interlaboratory study aimed at evaluating the performance of modern μ XRF systems, equipped with SDDs, for the forensic analysis of glass. The SDD- μ XRF systems provided improved precision and limits of detection (1.4 μ g/g – 1386 μ g/g), as well as excellent discrimination (> 99%) of different-source samples when applying the ASTM E2926 recommended comparison criterion. However, the false exclusion rates for same-source samples were relatively high (> 20%), suggesting a need to modify the recommended comparison criterion.

(P12) Relationship of DRE categories to the laboratory results in State of Maryland cases

Ying Ren, M.D., Ph.D., Yale Caplan, Ph.D. - Maryland State Police*

Drug-impaired driving has been a growing problem in the past decades. A Drug Evaluation and Classification Program (DECP) was developed to evaluate drivers for impairment due to drugs. The assessments are performed by personnel trained as drug recognition experts (DREs). They determine whether the suspect is impaired or not. Impairment may be caused by drugs, alcohol, or both, or other medical conditions. The DREs attempt to determine the source of the drugs according to the established drug categories.

In a preliminary study, we reviewed 120 cases to determine the relationship of the drug categories identified by the DRE examination with the laboratory results. Approximately 62% DRE classifications matched with the lab results. Maryland cases were only reported qualitatively, however a quantitative assessment of the positive results is provided. The major classes included cannabis, amphetamines and narcotic analgesics, principally fentanyl. Some subjects that used multiple drugs and/or other less common drugs that may not be included in the testing. A more detailed study will follow.

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Physical Evidence

(P7) Comparison of Human Perception versus ΔE for the Marquis Presumptive Test Producing a Yellow Product

Haylie Browning, Dr. Jeanne Berk, Ph.D., Dr. Audrey Ettinger, Ph.D. - Cedar Crest College*

Presumptive tests are commonly used in the field to identify the possible presence of biological fluids, drugs, and blood. Human perception of the color of these tests can result in interpreting the results incorrectly. This study compared the results of human perception versus delta E values of five known compounds that reacted with the Marquis reagent producing various shades of yellow products. Pictures of the products were captured, and a visual color meter app was used to determine LAB values allowing delta E values to be calculated by comparing the various products. Human participants were shown photos of the resulting yellow products and asked to determine if they were the same color or not, for photos with a delta E greater than 5, 82% got it correct, whereas when delta E less than 5, 47% got it correct.

(P14) The Stephan Cowans Wrongful Conviction: Cognitive Biases and Structural Quality Assurance Issues

Justine Hayward BS, John Morgan PhD - Loyola University Maryland

The Stephan Cowans wrongful conviction highlights multiple systemic issues that can occur in forensic science, specifically multiple areas cognitive bias could occur and lapses in quality assurance. An analysis of cognitive bias concerns in this case demonstrated that the latent print examiners in the case were possibly affected by confirmation, contextual, and target biases. This case further highlighted the multiple issues related to lack of quality assurance and administrative oversight, such as poor examiner training, deficiency of formal analysis protocol, and absence of bias reduction procedures. This analysis of the Stephan Cowans wrongful conviction supports the need for implementation of bias reduction training and procedures, as well as thorough administrative oversight of latent prints units.

(P6) Determination of wound colonization by larvae of *Calliphora vicina*

Lily Mead, Maddie Wilson, Dr. David Rivers - Loyola University Maryland*

Adult flies are purported to preferentially colonize wounds over other locations on a corpse. Our work has shown that gravid females of *Calliphora vicina* do not lay eggs in wounds, except under overcrowded laboratory conditions. This study was designed to examine the possibility that larvae crawled to wounds following oviposition. Under laboratory conditions using piglets with postmortem wounds, larval movement from the site of oviposition to the postmortem wound occurred in only 8% of all trials (n = 12). Larvae were not detected in the wounds until 38 h after egg deposition (at 25°C). This corresponds to when putrefaction begins to yield gas build up internally in the piglets. These observations suggest that neither larvae nor adults of *C. vicina* display preferential attraction to postmortem wounds on carrion and possibly human corpses.

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(P15) Becoming a Trained Serologist in 45 minutes: Developing a Serology Field Trip Experience for Middle School and High School Students

Leah Nangeroni - The Center for Forensic Science Research and Education

As our name implies, The Center for Forensic Science Research and Education (CFRSE) is dedicated to education and outreach in the forensic science community, especially for the next generation of forensic scientists. Since 2022, CFSRE has hosted numerous field trips for middle school and high school students in the Philadelphia region where young scientists can explore forensics outside of their classroom in three different disciplines which include biology, chemistry, and toxicology. After several field trip programs, the forensic biology department has developed a new 45-minute serology field trip where students learn the process of examining biological evidence commonly found at crime scenes and then determine their own “expert” opinion from unknown stains utilizing hands-on laboratory skills along with critical thinking skills.

(P1) A Fluorescent Enhancement Method for Footwear Impressions in Ice Melt Products

Abigail Thompson - Cedar Crest College

The enhancement of footwear impressions is an important aspect in the field of forensic science and can be used as inculpatory or exculpatory evidence in criminal cases. In this method, 8-hydroxyquinoline was deprotonated using a strong base complexed with common metals such as magnesium and calcium, which are common components of ice melt products. NaOH was applied to prints made on semi-porous tile using a fine mist sprayer, followed immediately by 8-hydroxyquinoline. These prints were viewed under 254nm light and were able to be viewed and photographed. This is a simple, efficient, and relatively safe method of impression enhancement and can easily be widely applied in forensic casework.

(P5) Examining common weed species' morphological and physiological response to nutrients provided by decomposing carrion in various soil types

Dr. Maren Veatch-Blohm and Martin MacStudy - Loyola University Maryland*

Clandestine graves act as barriers to crime scene investigations with no clear way of identifying when one exists. Previous research has linked the release of nutrients and elements from decomposing corpses to physiological and morphological responses in the surrounding soil and plants. However, limited data has been collected on those effects on soil types and weed species characteristic of Maryland. Our research has validated trends, such as soil pH increasing and percent weed coverage decreasing, and found the proximity of the plant to the decomposing material effects the amount of trace element taken up.