MSFS Research Topics:

2021-2022:

• Determining the method threshold for the identification of gasoline from laminate flooring,

• Determining the method threshold for the identification of gasoline from nylon carpeting,

• Evaluation of WGA on Digested DNA and DNA profile success,

• Individualization of DNA from Quercus alba using RT-PCR and HRM analysis,

• NGS of mDNA extracted from historic human remains,

• PCR HRM Assay for the detection of Camplobaceter and other foodborne pathogens,

• A single cell assay for the identification of body fluids,

• The examination of chromophoric chemical tests to detect and identify gunshot residues produced by frangible ammunition,

• Using FISH to screen for genetic abnormalities,

• Use of comet assay for the detection of DNA degradation of cellular samples,

• Detection of the effect of fire on genetic profiles,

• Comparison of DNA profiles with and without whole genome amplification for modern and historic bones,

• The effect of additional PCR cycles on genetic profile quality when amplifying historic and modern skeletal samples with the Qiagen Investigator 24 plex kit

2022-2023:

• Obtaining a STR DNA profile from fly maggots days after feeding on human flesh,

• Obtaining a STR DNA profile from wicked pads in serology test kits,

• DNA extraction and DNA typing of 12 soil samples from sites from Mid-Atlantic states,

• DNA extraction and STR DNA typing of dyed and natural human hairs,

• Development of a PCR melt assay to differentiate smokers and non-smokers via DNA Methylation,

- Disease association of STR and SNP loci used in forensic DNA genotyping,
- Generating a human STR DNA profile from Dermestid beetles,
- GCMS analysis of aging inks,
- Attribution of charcoal lighter fluids to manufacturer,
- Quantification of mitrgynine and OH_ mitragynine in kratom drinks,
- Determining the method threshold of gasoline from laminate flooring,
- Differentiation of red lipstick using microRaman spectroscopy,
- Construction of a 3D printed device for the electrophorectic separation of cells,
- Individualization of twins using pyrosequencing,
- Effect of decomposition on DNA development,
- Development of a RT-PCR quantitation assay,
- Use of Imagen data for biogeographic ancestry and phenotypic characteristics.

2023-2024:

- Quantification of mitragynine and OH-mitragynine in kratom drinks,
- Determining the threshold for the identification of gasoline from carpet padding,
- Improving the extraction efficiency of BGT from OTC supplements,
- SERS enhancement of GSR,
- Quantification of bergamottin and dehydroxybergamottin in supplements by HPLC,
- Differentiation of pink lipstick using microRaman spectroscopy,
- SERS enhancement of analytes extracted from smokeless powders,
- A single cell assay for the identification of body fluids,
- Development of a RT PCR quantitation assay,
- Development of a RT PCR assay for the determination of eye color,
- Effects of water-based lubricants on Human STR profiles generated from SANE/SAFE kit swabs,
- NGS of soil microbial analysis for geolocation prediction using 16 rRNA Gene,
- Comparison of EZ1 and Dabney DNA extraction methods for phalanx and long bones of human
- remains,
- Development of PCR HRM assays for predicting hair color and determining the accuracy of a commercial NGS phenotyping kit,
- Discrimination of monozygotic twins via pyrosequencing and NGS,

2024-2025:

• Evaluation of DNA Extraction Methods and Bone Types to Improve STR Profiles from Skeletal Remains,

• Recovering DNA from common clothing fabrics in the presence of cosmetic foundation,

• Effects of Water-Based Lubricants on Human STR Profiles Generated from SANE/SAFE Kit Swabs,

• DNA Recovery from Fired Cartridge Cases and Shotgun Shells Exposed to Various Weather Conditions,

• Forensic Investigative Genetic Genealogy Landscape Survey,

• GC/MS characterization of Smokeless Powder Analytes,

• Pen ink analysis using Raman spectroscopy,

• Differentiation of cathinones using ATR-FTIR and discriminant function analysis,

• Determining the method threshold for the identification of gasoline from different matrices, 10-ICP-MS and Dfa to attribute lipsticks to brands,

• Comparison of Latent Shoeprint Visualization Methods on Different Substrates,

• Extraction and quantitation of plant toxins,

• Discrimination of chocolate stains to various beverages using Raman and ATR-FTIR and PCA,

• Attribution of pepper gels to brands using Raman and IR spectroscopies with dfa,

• GC/MS identification of compounds in paints that interfere with identification of ignitable liquids

• Determining Biogeographic Ancestry using PCR-HRM

- Development of an enhanced method for differential extraction
- Using D-dimer agglutination for the detection of menstrual blood
- Determination of hair color using PCR-HRM
- Development of a PCR-HRM assay for the identification of breast milk Development of HRM assays for Legionella pneumoniae and Listeria monocytogenes,

2025-2026:

- Pen ink analysis using Raman Spectroscopy.

- Determination of chocolate stains to various beverages using Raman and ATR-FTIR and PCA
- HPLC determination of CBD concentrations in over-the-counter creams
- HPLC characterization of Smokeless Powder Analytes
- Attribution of brown kajal eyeliners
- Attribution of pepper gels to brands using Raman and IR spectroscopies of dfa
- NMR differentiation of kratom
- Assessing DNA yield in three bone sites using a powdering method
- Quantitative and Comparative analysis of DNA degradation in biological fluids under environmental conditions using qPCR, STR and Indel Genotyping
- Evaluation of PCR, HRM, SNaPshot, and NGS for genotyping of eye color SNPs
- DNA recovery from fired and unfired cartridges: the impact of size and “soaking” method
- The application of ATR-FTIR spectroscopy for the identification of cosmetic foundations versus environmental materials such as food or soil on cloth
- Accuracy study of ForenSeq Signature Prep kit DNA tool for human identification
- Skin and oral microbiomes as personal identification tools using 16S rRNA DNA sequencing, Geolocation determination using NGS typing of the 16S rRNA gene of different microbial communities of soil,
- Development and validation of an In-Tube method for body fluid identification targeting
- T-DMRs using PCR-HRM and bisulfite-treated DNA,
- Evaluating enzymatic conversion as an alternative to bisulfite treatment in PCR-HRM for forensic body fluid identification,
- Impact of environmental conditions on DNA detection in saliva following treatments on white fabrics
- Literature review of burned bone analysis for forensic decision-making (capstone)