

DEPARTMENT OF FORENSIC SCIENCE
COLLEGE OF CRIMINAL JUSTICE

Capstone Research Topics
Forensic Science

Sam Houston State University

24 June 2024



Academic Year 2023-2024

Detection and Validation of Novel and Traditional Benzodiazepines in Blood using Liquid Chromatography Quadrupole/Time-of-Flight Mass Spectrometry (LC-Q/TOF-MS) and Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS)

Development of an Artificial Intelligence Model for the Classification of Biological Fluids using Raman Spectroscopy

Identification of Inorganic Oxidizing Salts in Consumer Pyrotechnics using Microscopy, Recrystallization, Micro-Raman Microscopy, and SEM/EDS

Assessment of a Combined Portable Raman Spectroscopy and Mass Spectrometry Approach for the Analysis of Seized Drugs

Structural Characterization of Nitazene Analogs Using Electron Ionization-Mass Spectrometry (EI-MS)

Investigating the Degradation of Designer and Traditional Benzodiazepines using UV-Visible (UV-Vis) Spectrophotometry and Gas Chromatography-Mass Spectrometry (GC-MS)

Development of an Extraction and Detection Method for 2-Amino-2-thiazoline-4-carboxylic acid (ATCA) in Biological Matrices Using Liquid-Chromatography Tandem Mass Spectrometry (LC-MS/MS)

Evaluating the Capabilities of Spectroscopic and DART-MS Approaches for the Analysis of Architectural Paints

Strengthening Analysis of Sexual Assault Evidence and Understanding Long-Term Y-Screening Sample Stability

Evaluation of Infrared Spectroscopy and Chemometrics for the Discrimination of Electrical Tape Backings

Development and Validation of a Combined Selected Ion Monitoring-Scan GC-MS Method for Nitazene Analogs

Evaluation of Three Extraction Techniques on Human Skeletal Remains with Various Insults



Academic Year 2022-2023

Differentiation of Δ^9 -THC and CBD Using Ag-Ligand Ion Complexation and ESI-MS/MS

*The Detection and Quantitation of Ketamine in *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae) by GC-MS*

Probabilistic Tools for Improved Database Searching and Investigative Leads

Investigating the Capability of Micro-Raman Spectroscopy for the Analysis of Authentic Cannabis Samples

Differentiation of New and Used Transmission Fluids Using FT-IR and ICP-OES

Detection of Forensically Relevant Nitazenes Using Liquid Chromatography – Tandem Mass Spectrometry (LC-MS/MS)

Assessment of Field-Portable Instrumentation for the Detection of Intact Explosives

Quantitative Color Analysis of Burned Bone to Predict DNA Quantity, Quality, and Genotyping Success

Investigation of the Metabolism of Δ^9 -THC-O-Acetate

Investigating the Effect of Substitution Location on Fentanyl Analog Identification for Methyl-Substituted Fentanyl Analogs Using GC-EI-MS

Evaluation of Evidence MultiSTAT for Detection of Opioids in Urine & Oral Fluid

Evaluation of OpiumPlex for Genetic Profiling of Opium Poppy



Academic Year 2021-2022

Inter-laboratory Probabilistic Genotyping Parameters for Improved Forensic DNA Database Searching and Interpretation of DNA Mixtures

Optimized Recovery of DNA from Exhaled Breath Devices; from Drug Detection to Human Identification

Determination of Psilocybin, Psilocin, and Psilocybin in Plasma using LC-MS/MS

Understanding the Transfer, Persistence, Prevalence, and Recovery of DNA in a Real-life Social Setting

Development and Validation of a LC-MS Method for Detection of N, N-dimethyltryptamine and its Metabolites in Plasma

Quantitative Color Analysis of Burned Bone to Predict DNA Quantity, Quality, and Genotyping Success

Multifactorial Analysis of Soil Composition and DNA Typing from Buried Bones

The Efficiency of Three Swab Types and a Direct Lysis Approach for the Recovery of Touch DNA

Evaluation of the Casework Direct Kit and Investigator Casework GO! Kit for Direct Lysis Processing of Challenging Samples

Detection and Validation of Opioids in Dried Plasma Spots (DPS)

Identifying the Similarity Between In-source Collision-induced Dissociation (IS-CID) Fragment Ion Spectra and Tandem Mass Spectrometry (MS/MS) Product Ion Spectra Used for Seized Drug Identifications

Development of Polymer Coated Gold Nanoparticles to Augment a Handheld Raman Analyzer for Trace Chemical Detection

Characterizing Magnetic Bead Capture of Spermatozoa by Sperm-specific Biomolecules



Academic Year 2020-2021

Development of SERS Evidence Swabs for Forensic Applications using a Silver Nanoparticle Biosynthesis

Comparison of DNA Extraction Techniques for the Recovery of Bovine DNA from Maggots

Optimization of Sperm Capture Method using Three Antibodies in Conjunction with Magnetic Beads

Characterization of Automotive Greases via Scanning Electron Microscopy-Energy Dispersive X-Ray Spectroscopy (SEM-EDS)

Examining Partition Efficiency of Cell Types Following QIAcube/EZ1® Advanced XL Differential Extraction

Rapid Classification of Gasoline by Using a Handheld Raman Spectrometer

A More Effective, Automatable Differential Extraction Method for Processing Sexual Assault Samples

Differentiation of Synthetic Cathinone Isomers Using GC-EI-MS and Multivariate Analysis

Visualization of Seminal Stains on Dark Textiles

Reevaluation of Reflective Index Dispersion Measurements to the Differentiation of Automotive Glass

The Sexome: Evaluating the Effectiveness of Microbial DNA Extraction Kits for Intimate Samples

Optimization of InnoXtract™ Extraction and Purification System for DNA Extraction from Skeletal Samples

Fentanyl Analogs in Dried Plasma Spots; A Novel Technique

Quantification of Psilocybin and Psilocin in Plasma using LC-MS/MS



Academic Year 2019-2020

Development of a Five Dye Insertion/Deletion (INDEL) Panel for Ancestry Determination

Study of the Degradation of Artistic Varnishes due to Light Exposure by Pyrolysis Gas Chromatography/Mass Spectrometry (py-GCMS) and Fourier Transform Infrared (FTIR) Spectroscopy

Differentiation of Hemp from Marijuana using a Qualitative Decision-point Assay

Evaluation of the trnK-matK-trnK, ycf3, and accD-psal Chloroplast Regions to Differentiate Crop Type and Biogeographical Origin of Cannabis sativa

Evaluation of Three Swab Types for the Collection of Touch DNA

Development of a Novel Finger-trigger Interface for Trigger Pull Measurement

Detection of Five Kratom Alkaloids in Blood Using Agilent Ultivo Liquid Chromatography/Triple Quadrupole – Mass Spectrometry System

Screening of Tier One Drugs in Blood for DUID by LC-QqQ

Development of a Five-channel Insertion-deletion Multiplex for Human Identification Purposes

Characterization of Nylanthrene Dyes in the Differentiation of Macroscopically Similar Black Fibers using Light Microscopy and UV-vis Microspectrophotometry

Development of a Neural Network for the Detection and Differentiation of Pollen Grains for Forensic Analysis

Quantitative Determination of Caffeine in Nootropic Dietary Supplements Performed by LC-MS/MS using Liquid-liquid Extraction



Academic Year 2018-2019

Quantitative Identification of Mitragynine in Blood by Gas Chromatography-Mass Spectrometry

Data Fusion from Spectroscopic Techniques for the Discrimination of Colored Automotive Paint Mixtures

Comparison of Extraction Methods for Novel Synthetic Opioids in Blood

Fluorescent Components in Gunshot Residue

Quantification of Buprenorphine/Naloxone (Suboxone) in Breastmilk and Plasma

Quantitative Identification of Mitragynine in Urine using Gas Chromatography-Mass Spectrometry

Transmembrane Protein in Blood Clotting as an Indicator of Deep Neck Trauma

Glass Transfer and Persistence in Rubber-soled Shoes

Collection and Storage of DVI Samples with MicroFLOQ® Swabs for Direct Amplification

Human DNA Analysis of Crop Contents from Fly Larvae on Decomposing Cadavers

Analysis of Colored Felt-tipped Blending Markers Using Video Spectral Data, Gray Value Measurements, Thin-Layer Chromatography, and Raman Spectroscopy

*Development of a STR Multiplex for Forensic Identification of *Papaver somniferum**



Academic Year 2017-2018

Heated Headspace SPME-GC/MS for the Screening of Residual Psychoactive Substances in the Oral Cavity

The Characterization and Discrimination of Vehicular Greases, Transmission Fluids, and Brake Fluids

Comparing Factors that Influence Non-specific Amplification in Current Generation Commercially Available STR Genotyping Kits

Identifying Polymorphisms in the Carboxylesterase 1 (CES1) Gene Among a Juvenile Attention Deficit Hyperactivity Disorder (ADHD) Population Associated with Responses to Methylphenidate

Detection of Fentanyl Using Headspace Chemical Analysis

Design and Optimization of a Cost Effective, Massively Parallel Sequencing Workflow for Identifying Genetic Variants in the Carboxylesterase 1 Gene (CES1)

Identification of Novel Synthetic Benzodiazepines by GC-MS

Development of Magnetic Carbon Nanotubes for Dispersive Solid Phase Extraction of Cyanide Metabolite (2-aminothiazoline-4-carboxylic acid) in Biological Samples

Quantification of Novel Synthetic Opioids in Blood Using LC-MS/MS

Screening of Fentanyl Analogs in Whole Blood Using LC-QTOF Analysis

The Application of Gold Nanoparticles for Detecting Controlled Substances with Surface-Enhanced Raman Spectroscopy (SERS) Using Portable Raman

Forensic Application of Microsatellite Markers to Dog DNA Testing

Screening for Fentanyl Analogs and Metabolites Utilizing Portable Raman and Immunoassay Techniques

Quantification of U-47700 and Metabolites in Plasma by LC-MS/MS



The Comparison of the Repeatability and Discrimination of the Yellow, Blue, and Red Filters for Refractive Index Measurements Using the Hot-Stage Method

Academic Year 2016-2017

Genetic Analysis of Oxytocin and Serotonin-related Single Nucleotide Polymorphisms (SNPs) and Behavioral Assessment in Two U.S. Populations

Swab Collection and Room Temperature Preservation of DNA from Decomposing Human Skin

Determination of Methamphetamine and Amphetamine in Urine Using CSP-HRMS

Alternate DNA Extraction and STR Profiling Strategies for Skeletal Samples

Using Microbial Clocks in Human Cadaver Ribs to Estimate the Postmortem Interval

Preparation of Cannabis and its Botanical Structures for Analysis by SPME-GC-MS

Detection of Cannabinoids from Buccal Swabs Using One Vial Headspace Derivatization Coupled with SPME-GC-MS

Evaluation of Instrument Sensitivity and Stability for Magnetic Flux Measurement Relative to Toner Area as a Screening Tool for Casework Application

Quantification of Morphine, Codeine, and Thebaine in Home-Brewed Poppy Seed Tea by LC-MS-MS

DNA Degradation in Decomposing Cadavers and Gene Expression in Blood Deposits as Indicators of Postmortem Interval

Physicochemical Properties of Synthetic Cathinones: Implications for Postmortem Toxicology

Quantification of Suvorexant (Belsomra) in Blood Using LC-Q-TOF MS

The Variation in Time of the Chemical and Morphological Properties of Postmortem Root Banding of Human Hair using Raman Spectroscopy and Microscopical Examinations



Optimized Extraction of Endogenous Gamma Hydroxybutyrate (GHB) in Hair Using LC/MS/MS

Academic Year 2015-2016

Developmental Validation of a Chloroplast DNA Quantification System for *Cannabis sativa* Using Synthetic DNA as Reference Standards

Identification of Regioisomers via Gas Chromatography Coupled with Vapor-Phase Infrared Detection

Comparative STR Success of Challenging Samples When Using the Small Versus the Large Autosomal Target in the Quantifiler® Trio Kit

Analysis of Single Nucleotide Polymorphisms in Genes Affecting Dopamine Turnover in a Sample of Caucasian Males

Sample Collection of Fire Debris from Burned Cadavers for Ignitable Liquid Analysis

Analysis of a New Hypnotic (Suvorexant, Belsomra®) in Biological Samples Using GC/MS

Genetic Study of Single Nucleotide Polymorphisms (SNPs) within Genes of Oxytocin (OXT) and Serotonin Transporter (5-HTT) in a Caucasian Male Student Population

Comparative Tolerance of Short Tandem Repeat and Massively Parallel Sequencing Chemistries to Inhibited Samples

Changes to Human Bone During Decomposition in a Subtropical Humid Environment: An Experimental Histological Approach

Development and Evaluation of a miRNA System for Forensically Relevant Body Fluids Using Capillary Electrophoresis

Direct Examination of Synthetic Cannabimimetic Materials Using Ion Mobility Spectrometry for In-field Investigations

*Chemical Profiling of Street-seized *Cannabis sativa* L. Samples Using GC-MS Analysis*



Analysis of a New Hypnotic (Suvorexant, Belsomra) in Biological Samples Using LC-Q/TOF-MS

Analysis of DNA from Post-blast Pipe Bomb Fragments for Identification and Determination of Ancestry

Headspace Chemical Analysis of Water Samples Contaminated with Early Stage Human Decomposition

The Effect of Impact on High Intensity Discharge (HID) Headlight Systems

Academic Year 2014-2015

Identification of Mitragynine and its Metabolite in Biological Samples using High Resolution Mass Spectrometry

Genetic Study of SNPs in the Oxytocin Receptor

The Effectiveness of Various Whole Genome Amplification & Repair Methods to Improve STR Analysis of Formaldehyde-damaged DNA from Embalmed Cadavers

The Identification of Synthetic Cathinones Using LC-q-TOF-MS

The Effect of Decomposition on the Shooting Distance Determination of Cranial Gunshot Wounds

Rapid Detection and Characterization of Cannabimimetic Materials: Efficacy of Using Ion Mobility Spectrometry for Field Investigations

Using DNA Profiling to Discriminate Marijuana Sources

Method Development and Validation Studies: Chemical Profiling of Simulated Cannabis Samples Utilizing Gas Chromatography-Mass Spectrometry for Forensic Science Investigations of Street-Seized Samples

Comparison of DNA Yield & STR Success Rates from Different Tissues in Embalmed Bodies



Chemical Profiling of Seized Marijuana Samples of Headspace Solid-Phase Microextraction Coupled with Gas Chromatography-Mass Spectrometry

Evaluation of a Simple One-Step DNA Extraction Method for Low Template Samples

Metabolomics Approach for the Identification of Human Urine Stain Samples

Academic Year 2013-2014

Using SNP's to Determine the Association Between OXT, OXTR and SERT Genotypes and Aggressive Behavior

DNA Preservation of Forensically Relevant Insects without Refrigeration

The Postmortem Interval Formula for Southwest Texas Using Total Body Score and Accumulated Degree Days on Human Cadavers

Improved Decontamination and DNA Extraction Methods for Teeth

Optimization and Validation of a Rapid PCR Method for the PowerPlex 16 HS System for Forensic DNA Profiling

Evaluation of Tissue Damage, STR Profiling Success and DNA Extraction Efficiencies for Incinerated Human Teeth

Preservation and High Throughput Methods For Human Tissue Samples in Tropical Climates; An Improved DVI Approach

Forensic Botany: Molecular Identification of Pinus Pollen Grains in Surface Soil

Identification and Separation of Compounds Structurally Related to the Synthetic Cannabinoid N-(1-amino-3 methyl-1 oxobutan-20yl) -1-(4-flurobenzyl) -1H-indazole-3 carboxamine (AB-Fubinaca)

Toxicological Detection of Synthetic Cathinones using Novel Derivatization

Marijuana Profiling Using Headspace Solid Phase Microextraction Coupled with Gas Chromatography/Mass Spectrometry



Analysis of Non-Derivatized Synthetic Cathinones in Biological Samples using GC/MS

Determination of Salvinorin A and Salvinorin B in Urine

Stability of Synthetic Cathinones: Implications for Forensic Analysis

Elemental Soil Analysis of the Cadaver Island Using Inductively Coupled Plasma-Optical Emission Spectrometry

The Ability of the UV-IR Camera to Capture Latent Print Detail Following Chemical Enhancement

Academic Year 2012-2013

Pollen DNA: Application of STR Profiling to Discriminate Pollen at the Regional and Local Levels

Detection Of The “Legal High” Kratom (Mitragynine) In Biological Samples

Composition of the Maggot Mass Determined by Sequencing Data

Stability of Δ^9 -Tetrahydrocannabinol (THC) and 11-Nor-9-carboxy- Δ^9 -tetrahydrocannabinol (THC-COOH) in Whole Blood

Optimization and Validation of a rapid PCR Method for the PowerPlex® S5 System for Forensic DNA Profiling

Differentiating Between Antemortem and Postmortem Blood: A Comparison Study Via Headspace Solid-Phase Microextraction Methodology

Improved Detection of Synthetic Cathinone Designer Drugs in Forensic Toxicology Samples Using Gas Chromatography/Mass Spectrometry (GC/MS)



Academic Year 2011-2012

Developmental Validation of the LINE - 1 Marker for Use in a Sensitive Real - Time PCR Quantification Method

Determination of Endogenous Gamma-Hydroxybutyrate (GHB) in Human Hair

Extraction of Methamphetamine and Amphetamine from Postmortem Samples using a Molecularly Imprinted Polymer for Solid Phase Extraction (MIP-SPE)

Using SNPs to Determine the Association Between MAO, COMT, and DBH and Aggressive or Violent Behavior

Association Between Aggressive Behavior and the Androgen Receptor, Monoamine Oxidase A, and Serotonin Transporter Polymorphisms

The Detection of ATCA in Human Liver Autopsy Samples by Using LC/MS/MS

A Comparison of Alprazolam Concentrations in the Blood and Urine Using Solid Phase Microextraction

Detection of Beta-Keto Amphetamines in Biological Samples

Analysis of Postmortem Hair Banding by Raman Microscopy

Analysis of Designer Amphetamines in Blood by LC/MS/MS

A Molecular Approach: Species Composition of the Maggot Mass in Human Cadavers in the Pineywoods Ecoregion of Southeastern Texas

Analysis of Trace Condom Material with the use of Pyrolysis Gas Chromatography/Mass Spectrometry

Allele and Genotype Frequencies of DXS10074, DXS10075, and DXS10079 Markers in Buenos Aires Population (Argentina)

Validation of DNA Extraction from Tissue Samples for Forensic Casework on the Automated QIASymphony SP Platform



Monolithic Polymer Assisted Liquid Phase Microextraction

Academic Year 2010-2011

Simultaneous Detection of Psychedelic Amphetamines in Urine By LC/MS/MS

Population Study for Three Closely Linked X-Chromosome STR Markers in an Argentinean Population

Phenotype Informative SNPs as Predictor of Pigmentation Features

Detection of Synthetic Cannabinoids in Biological Samples

Determination of Psychedelic Amphetamines in Urine and Blood by GC/MS

Development of a 10 Multiplex System of Pigmentation-Prediction SNP Markers for Forensic Casework

Genetic Analysis of a Short Tandem Repeat in the Androgen Receptor Gene and a Variable Number Tandem Repeat in the Monoamine Oxidase A Gene for a Male Inmate Population in Texas

Population Study for Three Unlinked X-Chromosome STR Markers in an Argentinean Population

The Use of Infrared Imaging to Facilitate Fired Cartridge Case and Bullet Comparisons

Implications of Chemical Detergents in Fire Debris Analysis

Application of a Handheld Vacuum-Filter Device for Differential Sperm Separation

The Separation of Chiral Psychedelic Amphetamine by Molecular Imprinted Monolithic Polymer



Academic Year 2009-2010

Psychedelic Amphetamines in Blood and Urine by GC/MS

Comparative Study on Stability of DNA in Vitreous Humor, Cartilage, Tendons, and Nails for use as Alternative Sample Tissues in the Identification of Decomposed Cadavers

Determination of Psychedelic Amphetamines in Blood and Urine by LC/MS/MS

Study on SNPs relating to Ethnicity and Hair/Eye Pigmentation in a population of Texas

Quantitative Analysis of Salvinorin A (Salvia) in Biological Samples by LC/MS/MS

Endogenous GHB in Human Hair: Comparison of Chemical and Enzymatic Digestion

Application of mini-STRs to Low Copy Number Forensic Samples

Pollen DNA: A New Tool for Forensic Investigations

Assessment of Headspace SPME-GC-NPD in Determining Organic Gun Shot Residues in Different Matrices

Who is Chas Turner? (Onderdonk Historical Case)

Developing a Sensitive Real-Time PCR Method for Quantitation of DNA in Low Copy Number Forensic Samples

Academic Year 2008-2009

Determination of Designer Amphetamines in Urine using LC/MS/MS

Capillary Electrophoresis Screening Method Development for the Identification of Tetrahydrozoline Hydrochloride in Various Specimens

Determination of Designer Amphetamines in Urine using GC/MS



Forensic Analysis of HID (Xenon) Headlights: Determining On/Off State and Identifying Illegal Vehicle Modifications

Quantitative Analysis of Salvinorin A (Salvia) in Biological Samples and Dietary Supplements using GC/MS

Determination of Endogenous GHB Concentrations in Human Hair using LC/MS/MS

Application of AmpFISTR® Minifiler™ to Low-Copy Number

Pollen DNA: A New Tool for Forensic Investigations

LC/MS/MS Analysis of Hair for Personal Hair Care Products Utilizing a Soft Wash Extraction Method

Hollow Fiber Membrane-Liquid-Liquid-Liquid Microextraction (HFM-LLLME) Utilizing Ionic Liquid Membrane Transport for Benzodiazepines from Biological Samples

Rapid Identification of the Cyanide Metabolite 2-aminothiozoline-4-carboxylic Acid using Molecular Imprinted Polymer Stir Bar Sorption Extraction

Forensic Analysis of Non-toxic Ammunition by Double Shot Pyrolysis Gas Chromatography/Mass Spectrometry (PY-GC/MS)

Application of Single Nucleotide Polymorphisms (SNPs) in Forensic Casework

Academic Year 2007-2008

Identification of Ammunition Based on Quantitative Determination of Gun Powder Particles using GC/MS

Developmental Validation of – A Extensions by AmpFISTR Identifier PCR Amplification Kit

Validation of the AmpFISTR® MiniFiler™ PCR Amplification Kit and its Application to Identify Human Remains from a 1992 Helicopter Crash

Validation of the MiniFiler Kit: Stability Studies using UV and Other Environmental Factors



Validation Study of Scanning Electron Microscopic (SEM) Examination of Firing Pin Impressions

Probing Single Stranded DNA using Bioconjugated Quantum Dots

The Development and Employment of an Analytical Scheme to Determine the Discrimination Value between Automotive Paint Samples

Determination of Endogenous GHB Concentrations in Human Hair

Effects of Alternative Sources of Alcohol on the SCRAM Device

Screening and Quantitation of 24 Common Drugs of Abuse in Whole Blood

Analysis of New Designer Amphetamines in Urine Using Immunoassay, GC-MS and LC-MS-MS

Investigation of Stability and a Novel Derivatization of GHB using CI-GC-MS

Molecular Characterization of Forensically Significant Insects with Applied Molecular Identification of Skeletal Remains in Southern Texas

Academic Year 2006-2007

Quality Assurance/Quality Control Issues Arising with Fingerprint Evidence in a Post-Daubert World

Driving Behavior and Impairment Symptoms in Cannabinoid Positive Subjects Arrested for Driving Under the Influence of Drugs (DUID)

Tramadol: Analysis and Interpretation in Human Performance and Death Investigation Casework

Current Practices and Advances in Crime Scene Investigation

Methamphetamine Intoxication: Case Studies of Impaired Drivers and Related Fatalities



Driving Under the Influence of Methamphetamine: Comparison of Driving Behavior and Impairment Symptoms in Subjects Arrested for Driving While Intoxicated (DWI)

Validation Study to Determine the Highest Observed Stutter Peaks for Short Tandem Repeats (STRs)

Analysis, Use and Effects of Sedative Hypnotics - Forensic Implications

Glyphosate: Analytical and Forensic Implications of a Common Herbicide

An Analysis of Literary and Judicial Challenges on the Credibility and Admissibility of Evidence Submitted by Firearm Identification Laboratories

