FORENSIC SCIENCE & LAW

2023 GRADUATE RESEARCH SYMPOSIUM

MARCH 30th - 31st

DUQUESNE UNIVERSITY

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MEETING ID: 927 9925 6597

PASSCODE: FORENSIC (ALL LOWERCASE)

2023 SYMPOSIUM SCHEDULE

SYMPOSIUM WILL BE HELD AT THREE VARIOUS LOCATIONS, DEPENDING ON THE TIME & DAY.

DAY 1: MARCH 30	
FISHER HALL 625	
9:00AM	Hailey
9:30AM	Lexy
10:00AM	Savannah
10:30AM	**BREAK**
10:45AM	Paige
11:15AM	Matt
11:45AM	Jessica
12:15PM	Lauren T.
12:45PM	**BREAK**
LIBERMANN HALL 609	
2:00PM	Will
2:30PM	Michael
3:00PM	Maeve
3:30PM	**BREAK**
3:45PM	Hannah
4:15PM	Ashton
4:45PM	Jacob

DAY 2: MARCH 31	
ROCKWELL LECTURE HALL 1	
9:00AM	Shelby
9:30AM	Liz
10:00AM	Julianna
10:30AM	**BREAK**
10:45AM	Kayla
11:15AM	Isabella
11:45AM	Chris
12:15PM	Erika
12:45PM	**BREAK**
1:45PM	Jenna
2:15PM	Wes
2:45PM	Lauren D.
3:15PM	**BREAK**
3:30PM	Liam
4:00PM	Abby
4:30PM	Grace

DUQUESNE UNIVERSITY

DAY 1

THURSDAY, MARCH 30, 2023

9:00AM - 12:45PM

FISHER HALL 625

TIME	TITLE	PRESENTER
9:00AM	THE DEVELOPMENT OF A CENTRAL MAMMALIAN FUR DATABASE	HAILEY ADAMIK
9:30AM	EXAMINING DIFFERENCES IN EXONERATIONS ACROSS THE UNITED STATES	ALEXYS KARL
10:00AM	ASSESSING GENETIC DIVERSITY BETWEEN WILD AND CAPTIVE TURKEYS (*MELEAGRIS GALLOPAVO*) IN PENNSYLVANIA	SAVANNAH NGUYEN
10:30AM	**BREAK**	
10:45AM	THE ACCURACY OF NEXT GENERATION SEQUENCING ON HUMAN PHENOTYPIC TRAITS	PAIGE AYMAR
11:15AM	ASSESSMENT OF THE ACCURACY OF OBTAINING FACIAL IMAGES FROM DNA	MATTHEW POTOCK
11:45AM	OPTIMIZING A METHOD FOR SEPARATING AND QUANTIFYING CANNABINOIDS FROM BUCCAL FLUID ON THE LC/QQQ/MS	JESSICA THOMPSON
12:15PM	TRAINING, EDUCATION, AND CERTIFICATION OF FORENSIC DOCUMENT EXAMINERS ACROSS THE UNITED STATES	LAUREN TURNACIOGLU
12:45PM	**BREAK**	

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DAY 1 (CONTINUED)

THURSDAY, MARCH 30, 2023

2:00PM - 5:15PM

LIBERMANN HALL 609

TIME	TITLE	PRESENTER
2:00PM	TRENDS IN PROFILES OF OFFENDERS CAUGHT USING FORENSIC GENETIC GENEALOGY (FGG)	WILLIAM VAUSE
2:30PM	EFFECTS OF WATER SUBMERSION ON THE RECOVERY OF DNA FROM FIREARMS	MICHAEL REBHOLZ
3:00PM	ENVIRONMENTAL DNA DETECTION OF *LYCORMA DELICATULA* USING VARIOUS FORENSIC SWABS VIA STR ANALYSIS	MAEVE PICARIELLO
3:30PM	BREAK	
3:45PM	CADAVER DOGS AND HANDLERS: DETECTION OF ANCIENT BONES	HANNAH CAWLEY
4:15PM	SOURCE ATTRIBUTION FOR LIGHTER FLUIDS FROM FIRE DEBRIS	ASHTON MARINI
4:45PM	STREAMLINING THE EXTRACTION AND QUANTIFICATION OF SYNTHETIC CATHINONE IN ORAL FLUID BY MEANS OF SOLID-PHASE EXTRACTION (SPE) AND LC-MS/MS ANALYSIS	JACOB KATSAFANAS

DUQUESNE UNIVERSITY

9:00AM HAILEY ADAMIK — THE DEVELOPMENT OF A CENTRAL MAMMALIAN FUR DATABASE

WILDLIFE FORENSICS IS A BRANCH OF FORENSIC SCIENCE COMMONLY UTILIZED IN THE ISSUE OF POACHING/TRAFFICKING ENDANGERED ANIMALS - PREDOMINANTLY MAMMALS. KNOWLEDGE OF ANIMAL HAIR MORPHOLOGY CAN AID IN THESE ISSUES, AS WELL AS DOMESTIC ANIMAL ABUSE, MEAT ADULTERATION CASES, AND CRIME SCENE INVESTIGATIONS.1 MAMMALIAN SPECIES MAY VARY MORPHOLOGICALLY IN FUR CHARACTERISTICS REGARDING AGE, REGION, AND INTERSPECIFIC VARIATION. SUBSEQUENTLY, MANY EXISTING ATLASES ARE LIMITED IN THAT THEY ARE NON-INCLUSIVE, NON-DIGITAL, OR NOT FREELY AVAILABLE. AS A RESULT, THE DEVELOPMENT OF A DIGITALIZED FUR DATABASE WOULD BENEFIT THE REALM OF WILDLIFE FORENSICS. THE MACROSCOPIC/MICROSCOPIC ANALYSIS OF GUARD HAIRS USING SCANNING ELECTRON MICROSCOPY AND COMPOUND LIGHT MICROSCOPY CAN DISTINGUISH MORPHOLOGICAL VARIATIONS TO ASSIST IN SPECIES IDENTIFICATION. THESE TECHNIQUES CAN PROVIDE VISUAL REFERENCES REGARDING CUTICLE SCALE PATTERN, MEDULLARY TYPE, HAIR PIGMENTATION, AND MORE. OVERALL, THE IMPLICATIONS OF AN ACCESSIBLE FUR DATABASE INCLUDE PROVIDING HAIR EXAMINERS WITH CONSISTENT REFERENCES AND CONTINUING FUTURE RESEARCH IN WILDLIFE FORENSICS.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; STEPHANIE WETZEL, PH.D.; SAMARA TRUSSO

9:30AM ALEXYS KARL — EXAMINING DIFFERENCES IN EXONERATIONS ACROSS THE UNITED STATES

SINCE THE NATIONAL REGISTRY OF EXONERATIONS (NRE) BEGAN METHODICALLY TRACKING EXONERATIONS IN 1989, THERE HAVE BEEN 3,000+ RECORDED EXONERATIONS1. THIS RESEARCH WAS SPLIT INTO THREE PHASES. PHASE ONE CONSISTED OF A REPLICATION STUDY IN WHICH THE ROLE OF FORENSIC SCIENCE IN DNA EXONERATIONS WAS INVESTIGATED.2 PHASE TWO WAS AN ANALYSIS OF NON-DNA EXONERATIONS FOLLOWING THE SAME METHODOLOGY AS PHASE ONE. THE MAIN ANALYSES INCLUDED THE RELATIONSHIP BETWEEN FALSE OR MISLEADING FORENSIC SCIENCE AND OTHER COMMON CONTRIBUTING FACTORS TO WRONGFUL CONVICTIONS, AS WELL AS THE FREQUENTLY ASSOCIATED FORENSIC METHODS WITH WRONGFUL CONVICTIONS. PHASE THREE INVESTIGATED THE TRENDS ASSOCIATED WITH THE INVOLVEMENT OF INNOCENCE GROUPS IN EXONERATIONS. THE RESULTS OF THIS RESEARCH PROVIDE A REPRESENTATION OF EXONERATION TRENDS AND ALLOW A BETTER UNDERSTANDING OF HOW INNOCENCE GROUPS CAN AID IN CORRECTING WRONGFUL CONVICTIONS.

COMMITTEE MEMBERS: ***LYNDSIE FERRARA, PH.D.***; JOSHUA T. ELLSWORTH, PH.D.; STEPHANIE WETZEL, PH.D.; JOHN RAGO, J.D.

10:00AM SAVANNAH NGUYEN — ASSESSING GENETIC DIVERSITY BETWEEN WILD AND CAPTIVE TURKEYS (*MELEAGRIS GALLOPAVO*) IN PENNSYLVANIA

THE WILD TURKEY, *MELEAGRIS GALLOPAVO*, ENDEMIC TO NORTH AMERICA, IS A COMMON AND POPULAR GAME SPECIES. THOUGH THE SPECIES IS NATIVE TO NORTH AMERICA, THERE REMAINS INADEQUATE KNOWLEDGE IN ASSESSING GENETIC DIVERSITY AND IDENTIFYING BREEDING POPULATIONS. IF A TURKEY IS HUNTED OUTSIDE A STATE'S DESIGNATED HUNTING PERIOD OR WITHOUT A PROPER LICENSE, THAT TURKEY IS POACHED. BECAUSE OF THE GRAY AREAS BETWEEN HUNTING AND STATE LINES, THERE IS A NEED FOR MORE GENETIC TESTING. A SHORT TANDEM REPEAT (STR) PRIMER PANEL FOR THE WILD TURKEY HAS BEEN DEVELOPED (11 LOCI). IN THIS STUDY, AMPLIFYING MICROSATELLITES IN WILD AND CAPTIVE TURKEYS MAY REVEAL GENETIC DIFFERENCES AND CHANGES DUE TO DOMESTICATION. MORE DIVERSITY IS EXPECTED AMONGST WILD TURKEYS, AND LESS VARIATION IS PRESENT IN DOMESTIC TURKEYS. THESE FINDINGS ARE ESSENTIAL AS THEY CAN HELP IDENTIFY THE ORIGINS OF TURKEY MEAT, WILD OR DOMESTIC.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; LYNDSIE FERRARA, PH.D.; NICOLE CHINNICI, D.HSC, C.W.F.S.; PAMELA MARSHALL, PH.D.

10:45AM PAIGE AYMAR

THE ACCURACY OF NEXT GENERATION SEQUENCING ON HUMAN PHENOTYPIC TRAITS

DNA PHENOTYPING IS THE SCIENCE OF PREDICTING EXTERNALLY VISIBLE CHARACTERISTICS (EVC) OF A PERSON FROM THEIR DNA SAMPLE. USING NEXT-GENERATION SEQUENCING (NGS), PHYSICAL PREDICATIONS OF A PERSON CAN BE MADE. WITH NGS QUICKLY ADVANCING IN THE FIELD OF FORENSIC SCIENCE, LITTLE RESEARCH CAN BE FOUND ABOUT THIS TECHNIQUE'S PERFORMANCE. THE QUESTION THIS STUDYAIMS TO ANSWER IS HOW ACCURATE NGS IS AT PREDICTING PHENOTYPIC TRAITS. THE MISEQFGX GIVES EXACT PREDICTIONS FOR HAIR AND EYE COLOR BASED ON THE HIRISPLEX MODEL, BUT IT IS TO BE NOTED THATSKIN COLOR PREDICTION IS BASED ON BIOGEOGRAPHICAL ANCESTRY FROM 1000 GENOME DATA. A TOTAL OF 12 SAMPLES WERE ANALYZED USING THE NGS SYSTEM TO EVALUATE ITS ACCURACY IN PREDICTING HAIR COLOR, EYE COLOR, AND SKIN COLOR. THIS TECHNOLOGY IS AN IMPORTANT TOOL DURING FORENSIC INVESTIGATIONS TO AID IN DEVELOPING A DNA PROFILE, WHETHER A VICTIM OR SUSPECT.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; LISA LUDVICO, PH.D.; RHONDA ROBY, PH.D.

11:15AM MATTHEW POTOCK

ASSESSMENT OF THE ACCURACY OF OBTAINING FACIAL IMAGES FROM DNA

DEOXYRIBONUCLEIC ACID (DNA) IS KNOWN AS THE CARRIER OF GENETIC INFORMATION. THIS STUDY AIMS TO SEQUENCE THE GENETIC CODE AND DETERMINE IF AN ACCURATE 3D MODEL OF A HUMAN'S FACE COULD BE CONSTRUCTED FROM THEIR DNA. SAMPLES TAKEN FROM VOLUNTEERS OF DIFFERENT RACIAL/GENDER BACKGROUNDS WERE EXTRACTED AND AMPLIFIED WITH THE QIAGEN DNEASY EXTRACTION KIT. NEXT GENERATION SEQUENCING (NGS) WAS USED TO PROCESS MULTIPLE DNA SEQUENCES IN PARALLEL, MEANINGTHOUSANDS OF FORENSIC MARKERS CAN BE ANALYZED TO SEQUENCE LEVEL IN A SINGLE ASSAY. THIS WAS DONE THROUGH THE USE OF THE VEROGEN FORENSEQ SIGNATURE PREP KIT, WHICH PROVIDES HIGH RESOLUTION SEQUENCING OF 153 IDENTIFYING MARKERS, THE MISEQ FGX SEQUENCING SYSTEM, AND THE FORENSEQ UNIVERSAL ANALYSIS SOFTWARE (UAS). THE UAS WAS USED TO INTERPRET PHENOTYPICAL DATA AND GIVEINFORMATION SUCH AS BIOLOGICAL ANCESTRY AND SKIN/EYE COLOR. THIS DATA WILL BE USED TO CREATE 3DMODELS OF EACH SUBJECTS' FACE WHICH WILL BE COMPARED TO PHOTOS OF EACH SUBJECT. RESULTS OF THIS STUDY ARE IN THEIR PRELIMINARY STAGES, BUT THE AUTHORS PREDICT THAT ACCURATE MODELS OF HUMAN FACES CAN BE CREATED. THIS STUDY HOPES TO PROVIDE A NEW TECHNIQUE FOR FORENSICS LABS TO IDENTIFY PERSONS OF INTEREST, RE-OPEN COLD CASES, AND IDENTIFY REMAINS.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; LISA LUDVICO, PH.D.; RHONDA ROBY, PH.D.

11:45AM JESSICA THOMPSON

OPTIMIZING A METHOD FOR SEPARATING AND QUANTIFYING CANNABINOIDS FROM BUCCAL FLUID ON THE LC/QQQ/MS

CANNABIS SATIVA L., BETTER KNOWN AS MARIJUANA, HAS SPARKED CONTROVERSY FOR DECADES DUE TO THE PSYCHOACTIVE ACTIVITY OF THE BEST-KNOWN CANNABINOID, (-)-TRANS-Δ9- TETRAHYDROCANNABINOL (Δ9 -THC). AS MEDICINAL AND RECREATIONAL USE ARE IN THE PROCESS OF BEING LEGALIZED, THERE IS A NEED FOR AN OPTIMIZED METHOD TO BOTH IDENTIFY AND QUANTIFY CANNABINOIDS FOR ACCURATE MEASUREMENTS OF INTOXICATION. THE CURRENT STANDARD DRUG TESTS USE URINE, WHICH CAN TEST POSITIVE FOR Δ9 -THC FOR UP TO A MONTH AFTER CONSUMPTION. ORAL FLUID CAN NOT ONLY BE USED TO DETERMINE MORE RECENT USE, BUT IT CAN ALSO HELP DISTINGUISH BETWEEN STRUCTURALLY SIMILAR Δ9 -THC DERIVATIVES WHOSE METABOLITES ARE ALMOST INDISTINGUISHABLE IN URINE. A QUANTIFICATION METHOD FOR Δ9 -THC AND CBD FROM ORAL FLUID USING LIQUID CHROMATOGRAPHY/ TRIPLE QUADRUPOLE/ MASS SPECTROSCOPY WAS FURTHER OPTIMIZED AND EXPANDED TO INCLUDE OTHER THC ANALOGS SUCH AS Δ8 -THC, Δ10 -THC, AND THC-O.

COMMITTEE MEMBERS: ***STEPHANIE WETZEL, PH.D.***; PAMELA MARSHALL, PH.D.; COLETTE MIRANDA, M.S.

12:15PM LAUREN TURNACIOGLU

TRAINING, EDUCATION, AND CERTIFICATION OF FORENSIC DOCUMENT EXAMINERS ACROSS THE UNITED STATES

THE PURPOSE OF THIS STUDY WAS TO INVESTIGATE THE TRAINING, CERTIFICATION, AND EDUCATION OF FORENSIC DOCUMENT EXAMINERS IN THE UNITED STATES. A SURVEY WAS CONDUCTED USING QUALTRICS™ SOFTWARE. THE SURVEY INCLUDED QUESTIONS ON DEMOGRAPHICS, CERTIFICATION, TRAINING, AND EDUCATION. RECRUITMENT EMAILS WERE SENT TO FORENSICS ORGANIZATIONS. QUALITATIVE AND QUANTITATIVE COMPARISONS WERE USED TO DETERMINE IF THERE WAS SIGNIFICANT VARIATION AMONG DIFFERENT LABORATORIES. IT WAS CONCLUDED THAT THE FIELD LACKED UNIFORMITY IN HOW TRAINING STANDARDS WERE APPLIED, AS RESPONDENTS' ANSWERS DIFFERED. VAST VARIATIONS IN TIMING EXISTED FOR THE TIME SINCE LAST CERTIFICATION AND PROFICIENCY TEST. TYPE OF EDUCATION AND TRAINING REQUIRED BY DIFFERENT ORGANIZATIONS VARIED GREATLY. ANOTHER NOTABLE TREND WAS THE STATUS OF ACCREDITATION BASED ON THE TYPE OF LABORATORY WHERE THE EXAMINER WAS EMPLOYED. ALL RESPONDENTS EMPLOYED AT A GOVERNMENT LABORATORY INDICATED THE LABORATORY WAS ACCREDITED, WHILE MOST EXAMINERS EMPLOYED PRIVATELY INDICATED THE OPPOSITE.

COMMITTEE MEMBERS: ***LYNDSIE FERRARA, PH.D.***; GARY LICHT; KHODY DETWILER; LISA LUDVICO, PH.D.

2:00PM WILLIAM VAUSE

TRENDS IN PROFILES OF OFFENDERS CAUGHT USING FORENSIC GENETIC GENEALOGY (FGG)

FORENSIC GENETIC GENEALOGY (FGG) IS A NEW TOOL IN THE FORENSIC SCIENCE COMMUNITY WHICH ALLOWS VIOLENT OFFENDERS TO BE IDENTIFIED BY GENETIC SIMILARITIES THEIR RELATIVES SHARE WITH A DNA SAMPLE. SINCE FGG IS SO NEW AND LIMITED IN ITS USE, IT IS IMPORTANT TO EXAMINE THE TYPES OF OFFENDERS FGG IS SUCCESSFULLY IDENTIFYING. IN ORDER TO ADDRESS THIS TOPIC A WAY TO ANALYZE THE CASES WHICH PROVIDED INSIGHT INTO VARIATION IN THE OFFENDERS WAS DEVELOPED. THIS ENTAILED ANALYZING THE CASE TO DETERMINE THE CRIMINAL RECORD OF THE OFFENDER. FROM THERE POTENTIAL CASES WERE IDENTIFIED BY RESEARCH AND FREEDOM OF INFORMATION ACT (FOIA) REQUESTS WERE FILED. THROUGH THESE THE CASE FILES FOR EACH INDIVIDUAL CASE WERE OBTAINED WHICH ALLOWED CRIMINAL HISTORY, THE DATE OF THE CRIME, AND OTHER KEY INFORMATION TO BE IDENTIFIED. IN CASES WHERE THIS INFORMATION NEEDED TO BE SUPPLEMENTED ADDITIONAL RESEARCH WAS DONE.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; COLLEEN FITZPATRICK, PH.D.; LYNDSIE FERRARA, PH.D.; BRIAN KOHLHEPP, M.A.

2:30PM MICHAEL REBHOLZ

EFFECTS OF WATER SUBMERSION ON THE RECOVERY OF DNA FROM FIREARMS

FIREARMS ARE OFTEN USED AND HANDLED IN CRIMES. THEY ARE COMMONLY FOUND IN BODIES OF WATER AND SUBMITTED TO FORENSIC LABORATORIES FOR DNA TESTING. OVER TIME IT IS GENERALLY ASSUMED THAT WATER CAN HAVE NEGATIVE EFFECTS ON THE COLLECTION OF DNA FROM SUBMERGED ITEMS. THIS STUDY AIMED TO DETERMINE THE EFFECTS OF WATER SUBMERSION ON THE RECOVERY AND EXTRACTION OF DNA FROM FIREARMS. A 24-HOUR TRIAL AND A 72-HOUR TRIAL WERE CONDUCTED. IN BOTH TRIALS, TRACE DNA WAS DEPOSITED ONTO PISTOL MAGAZINES THEN SUBMERGED, DRIED, AND COLLECTED. THE PROMEGA DNA IQTM SYSTEM CASEWORK PROTOCOL EXTRACTION PROTOCOL WAS EMPLOYED, AND THE DNA QUANTITIES RECOVERED WERE COMPARED USING REAL-TIME PCR. SAMPLES EXTRACTED YIELDED LOW QUANTITIES OF LOW TEMPLATE DNA. GENOTYPES WERE OBTAINED USING GLOBALFILER™ PCR AMPLIFICATION KIT AND ANALYZED USING GENEMARKER® HID SOFTWARE. ULTIMATELY, THIS RESEARCH WILL HELP PREDICT THE PROBATIVE VALUE OF SUBMITTING RECOVERED SUBMERGED FIREARMS FOR DNA TESTING.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; LISA LUDVICO, PH.D.; BRIAN KOHLHEPP, M.A.

3:00PM MAEVE PICARIELLO

ENVIRONMENTAL DNA DETECTION OF *LYCORMA DELICATULA* USING VARIOUS FORENSIC SWABS VIA STR ANALYSIS

THE PURPOSE OF THIS RESEARCH WAS TO DETERMINE THE MOST EFFECTIVE FORENSIC SWAB FOR USE IN PROACTIVELY DETECTING THE PRESENCE OF THE INVASIVE SPOTTED LANTERNFLY *LYCORMA DELICATULA* EARLY INTO ITS INVASION OF NON-NATIVE REGIONS SO THAT THE ENVIRONMENTAL DAMAGE IT CAUSES CAN BE PREVENTED. THIS OBJECTIVE WAS ADDRESSED BY UTILIZING STR ANALYSIS OF A L. DELICATULA STR.ENVIRONMENTAL DNA (EDNA) WAS COLLECTED ON DUQUESNE UNIVERSITY'S CAMPUS USING THREE TYPES OF FORENSIC SWABS, WHICH WERE COMPARED BASED ON THEIR ABILITY TO COLLECT L. DELICATULA DNA EARLY IN THE INSECT'S LIFECYCLE. SWABBED EDNA WAS AMPLIFIED WITH SPECIES-SPECIFIC PRIMERS, THEN ANALYZED VIA GEL ELECTROPHORESIS TO DETERMINE THE PRESENCE OF L. DELICATULA IN ENVIRONMENTAL SAMPLES. IT WAS PREDICTED THAT L. DELICATULA WOULD BE DETECTED AT THE EARLIEST POST-HATCH DATE IN WET COTTON SWAB EXTRACTS. A CONCLUSION HAS NOT YET BEEN REACHED REGARDING WHICH SWAB TYPE IS THE MOST EFFECTIVE FOR THIS METHOD.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; BRYAN DELIUS, PH.D.; JAY LOSIEWICZ, M.A.

3:45PM HANNAH CAWLEY

CADAVER DOGS AND HANDLERS: DETECTION OF ANCIENT BONES

CADAVER DOGS ARE WORKING DOGS, OFTEN BROUGHT ON SEARCH AND RESCUE MISSIONS OR TO THE SCENES OF POTENTIAL CRIMES TO HELP LOCATE MISSING AND DECEASED PERSONS. THEY HAVE ALSO BEEN USED IN ARCHAEOLOGY TO LOCATE ANCIENT BURIALS, BECAUSE CANINES POSSESS A POWERFUL OLFACTORY. IN THIS RESEARCH, FIVE CADAVER DOGS WERE ASSESSED BY THEIR ABILITY TO LOCATE HUMAN BONES FROM GREECE, DATED AROUND 580 A.D. IT WAS PREDICTED THAT THEY WOULD BE ABLE TO MAKE SUCCESSFUL DETECTIONS IN EACH TRIAL. TO DATE, NO RESEARCH HAS BEEN CONDUCTED AND PUBLISHED TO ASSESS THE PRECISION, ACCURACY, AND REPRODUCIBILITY OF CADAVER DOG DETECTIONS ON ANCIENT BONES. THIS RESEARCH HAS THE POTENTIAL TO DEMONSTRATE THOSE CAPABILITIES. ALSO, TO INDICATE IF PREVIOUSLY REPORTED SUCCESS AT LOCATING BURIAL SITES WAS HEAVILY INFLUENCED BY SCENTS IN THE SOIL OR IF HUMAN BONES THEMSELVES STILL GIVE OFF DETECTABLE SCENT AFTER OVER 1,000 YEARS.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; CINDY BRADEN; LYNDSIE FERRARA, PH.D.

4:15PM ASHTON MARINI

SOURCE ATTRIBUTION FOR LIGHTER FLUIDS FROM FIRE DEBRIS

IDENTIFYING THE BRAND OF LIGHTER FLUID AFTER BURNING CAN BE INCREDIBLY IMPACTFUL TO THE FORENSIC NVESTIGATION OF ARSON CASES. WITH THIS IN MIND, LITTLE PROGRESS HAS BEEN MADE IN REGARD TO DETERMINING THE SPECIFIC ACCELERANT USED AT A SCENE. IT IS IMPERATIVE TO DETERMINE IF THE VARIETY OF BRANDS AVAILABLE TO CONSUMERS CAN BE INDIVIDUALIZED. A CHARCOAL EXTRACTION METHOD AND GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS) ANALYSIS WERE USED TO COMPARE FIVE BRANDS OF LIGHTER FLUID AFTER BURNING ON THREE DIFFERENT SOURCE MATERIALS TO DETERMINE IF THEY CAN BE CLASSIFIED AS STATISTICALLY DIFFERENT BY USE OF DISCRIMINANT ANALYSIS. IT IS EXPECTED THAT EACH BRAND OF LIGHTER FLUID CAN BE DISTINGUISHED FROM ONE ANOTHER. THE RESULTS FROM THIS EXPERIMENT WILL PROVIDE REFERENCES FOR EACH LIGHTER FLUID. IN THEORY, AN ARSON INVESTIGATOR WILL BE ABLE TO COLLECT FIRE DEBRIS WHICH CAN BE TESTED AND COMPARED TO THE KNOWN RESULTS TO DETERMINE THE BRAND USED.

COMMITTEE MEMBERS: ***STEPHANIE WETZEL, PH.D.***; PAMELA MARSHALL, PH.D.; MANDY TINKEY, M.S.; JOHN KERN, PH.D.

4:45 JACOB KATSAFANAS

STREAMLINING THE EXTRACTION AND QUANTIFICATION OF SYNTHETIC CATHINONE IN ORAL FLUID BY MEANS OF SOLID-PHASE EXTRACTION (SPE) AND LC-MS/MS ANALYSIS

SYNTHETIC CATHINONE, OFTEN REFERRED TO AS "BATH SALTS," IS CHARACTERIZED AS THE BETA-KETONE ISOMER OF AMPHETAMINE IN A MORE POTENT FORMULATION WHILE AVOIDING SEVERAL LEGISLATIVE ROADBLOCKS WITH CONSTANT STRUCTURAL MODIFICATIONS (I.E. METHYLATION). IT IS OF FORENSIC INTEREST TO DEVELOP A STREAMLINED METHODOLOGY FOR THE ANALYSIS OF SUBSTANCES GIVEN THE CURRENT BACKLOG TRENDS. THE GOAL WAS TO MINIMIZE THE STEPS AND SOLVENTS OF EXTRACTION TO BE ANALYZED ON AN AGILENT 6460 (QQQ) WHILE NOT AFFECTING THE INTEGRITY OF ORAL FLUID SAMPLES. SPECIMEN WERE PREPARED IN TRIPLICATES TO 0.5ML SYNTHETIC ORAL FLUID WITH PH 9.0 BORATE BUFFER. EXTRACTION WAS CARRIED OUT BY LIMITING REAGENTS USING A PREVIOUSLY ESTABLISHED METHODOLOGY AND CLEAR SCREEN DAU (200MG; 10ML) SPE CARTRIDGES.PRELIMINARY RESULTS DO SUGGEST THE REMOVAL OF SOLVENTS PER STEPS ALLOWS FOR THE EFFECTIVE ALLOW FOR THE TIMELY EXTRACTION AND SEPARATION OF COMPOUNDS. GOING FURTHER, IT IS NECESSARY TO THOROUGHLY VALIDATE THE METHOD.

COMMITTEE MEMBERS: ***STEPHANIE WETZEL, PH.D.***; PAMELA MARSHALL, PH.D.; MANDY TINKEY, M.S.

CONCLUSION OF DAY 1.

DAY 2

FRIDAY, MARCH 31, 2023

9:00AM - 4:30PM

ROCKWELL LECTURE HALL 1

TIME	TITLE	PRESENTER
9:00AM	IMPROVING FORENSIC SCIENCE EDUCATION WITHIN A LAW SCHOOL CURRICULUM	SHELBY KMIDOWSKI
9:30AM	REVISITING THE CSI EFFECT: HAS THE POPULARITY OF CRIME MEDIA CHANGED ANYTHING?	ELIZABETH DILTZ
10:00AM	AMERICA'S COURT SYSTEM THROUGH THE LENS OF A PANDEMIC: THE PAST, PRESENT, AND FUTURE ADAPTATIONS	JULIANNA FIREK
10:30AM	BREAK	
10:45AM	CHARACTERIZATION AND DETECTION OF SWIPE SAMPLED PEROXIDE-BASED EXPLOSIVE RESIDUES USING PAPER SPRAY IONIZATION-TANDEM MASS SPECTROMETRY (PSI-MS)	KAYLA MASSARI
11:15AM	THE EXTRACTION AND IDENTIFICATION OF ILLICIT COMPOUNDS FROM BAKED GOODS USING PAPER SPRAY IONIZATION - TANDEM MASS SPECTROMETRY (PSI-MS)	ISABELLA HABERSTOCK
11:45AM	DETECTION OF DRUG SPECIES IN SURGICAL MASKS USING PAPER SPRAY IONIZATION - MASS SPECTROMETRY WITH A SIMULATED BREATHING APPARATUS	CHRISTOPHER FARMEN
12:15PM	COMPARISON OF EXTRACTION METHODS FOR METHAMPHETAMINE AND METABOLITES FROM VITREOUS FLUID VIA LCMS/MS-QQQ ANALYZATION	ERIKA SOBOL
12:45PM	BREAK	

DUQUESNE UNIVERSITY

DAY 2 (CONTINUED)

FRIDAY, MARCH 31, 2023

9:00AM - 4:30PM

ROCKWELL LECTURE HALL 1

TIME	TITLE	PRESENTER
1:45PM	THE DNA ANALYSIS OF THE HUMAN TISSUE LEACHING FROM DIFFERENT SOIL DEPTHS	JENNA HAMILTON
2:15PM	THE EFFECTS OF TEMPERATURE AND PRECIPITATION ON THE AMOUNT OF RECOVERABLE HUMAN DNA FROM SOIL DURING DECOMPOSITION	WESLEY WAGNER
2:45PM	THE IMPACT OF EARTHWORM ACTIVITY ON THE MOVEMENT OF HUMAN DNA INTO SOIL	LAUREN DANGEL
3:15PM	BREAK	
3:30PM	DEVELOPMENT OF A CONSERVED SEMENOGELIN I AND II EPITOPE FOR SEMEN IDENTIFICATION WITH RESPECT TO ALLELIC VARIATION	WILLIAM GIBBS
4:00PM	ANALYSIS OF EIGHT LITHUANIAN TEMPORAL BONES WITH ANATOMICAL ABNORMALITIES AND SKELETAL EVIDENCE OF MIDDLE EAR INFECTIONS	ABIGAIL MCNAMEE
4:30PM	THE STUDY OF HYOID BONE FRACTURE PATTERNS	GRACE STOCKMAL

DUQUESNE UNIVERSITY

9:00AM SHELBY KMIDOWSKI

IMPROVING FORENSIC SCIENCE EDUCATION WITHIN A LAW SCHOOL CURRICULUM

MANY, IF NOT MOST, CRIMINAL LAWYERS AND JUDGES DO NOT HAVE A BACKGROUND IN THE FORENSIC SCIENCE. MANY STUDIES HAVE ASSESSED WHERE LAWYERS GAIN THEIR FORENSIC SCIENCE KNOWLEDGE, MOST COMMONLY THROUGH CONTINUING LEGAL EDUCATION COURSES OR THROUGH TRIAL EXPERIENCE. TO ADDRESS THIS ISSUE, AN ONLINE MODULE ON DNA ANALYSIS WAS DEVELOPED ON CANVAS TO DETERMINE IF THE MODULE INCREASED CRIMINAL LAW STUDENTS' KNOWLEDGE ON DNA ANALYSIS. A PRE AND POSTTEST WAS UTILIZED TO DETERMINE IF THERE WAS A GAIN OF KNOWLEDGE FROM THE COURSE. BOTH THE TESTS WERE THE SAME QUESTIONS TO BETTER ANALYZE THE SCORES. THE INCREASE IN TEST SCORES SHOW THE IMPORTANCE OF TEACHING BASIC FORENSIC SCIENCE TECHNIQUES TO CRIMINAL LAW STUDENTS. IF FORENSIC SCIENCE IS INCORPORATED INTO LAW SCHOOL CURRICULUMS, THE STUDENTS WILL BE BETTER EQUIPPED TO HANDLE FORENSIC EVIDENCE IN COURT QUICKLY UPON BECOMING A LICENSED, PRACTICING ATTORNEY RATHER THAN GAINING THIS KNOWLEDGE THROUGHOUT THEIR CAREER.

COMMITTEE MEMBERS: ***LYNDSIE FERRARA, PH.D.***; BOBBI JO WAGNER, J.D.; PAMELA MARSHALL, PH.D.; JANE MORIARTY, J.D.

9:30AM ELIZABETH DILTZ

REVISITING THE CSI EFFECT: HAS THE POPULARITY OF CRIME MEDIA CHANGED ANYTHING?

CSI: CRIME SCENE INVESTIGATION, NCIS, FORENSIC FILES, 48 HOURS, THESE ARE ALL TELEVISION PROGRAMS WITH A FOCUS ON FORENSIC SCIENCE AND CRIME INVESTIGATION. WHILE TWO OF THESE SHOWS (FORENSIC FILES AND 48 HOURS) FOCUS ON REAL CRIME STORIES, CSI AND NCIS ARE DRAMATIZATIONS OF THE WORLD OF FORENSIC INVESTIGATIONS THAT HAVE LED TO THE IDEA OF A PHENOMENON KNOWN AS THE "CSI EFFECT." THIS PHENOMENON IS COMMONLY DEFINED AS JURORS BEING INFLUENCED BY SHOWS LIKE CSI AND THE PORTRAYAL OF FORENSICS LEADING TO MORE ACQUITTALS WHEN EVIDENCE IS LACKING. PRIOR RESEARCH HAS SHOWN NO EXISTENCE OF A CSI EFFECT, BUT THIS RESEARCH AIMS TO SEE IF CRIME MEDIA SUB-GENRE WATCHING (TRUE CRIME VERSUS CRIME DRAMAS) HAS AN IMPACT IN JUROR VERDICT DECISION MAKING OR EVIDENCE EXPECTATIONS. ADDITIONALLY, THIS RESEARCH INVESTIGATED THE IMPACT OF THE CSI EFFECT ON CRIMINAL JUSTICE PRACTITIONERS AS PRIOR RESEARCH HAS NOT THOROUGHLY INVESTIGATED THIS ASPECT.

COMMITTEE MEMBERS: ***LYNDSIE FERRARA, PH.D.***; BOBBI JO WAGNER, J.D.; SARA BITNER/WALKER; LISA LUDVICO, PH.D.

10:00AM JULIANNA FIREK

AMERICA'S COURT SYSTEM THROUGH THE LENS OF A PANDEMIC: THE PAST, PRESENT, AND FUTURE ADAPTATIONS

IN MARCH OF 2020, THE COURTS SHUT DOWN, ALONG WITH THE REST OF THE WORLD. DURING THIS UNPRECEDENTED TIME, FIGURING OUT A WAY TO CONTINUE WITH LEGAL PROCEEDINGS WAS A DIFFICULT FEAT THAT EACH COURT DID INDEPENDENTLY, WITHOUT UNIVERSAL GUIDELINES. PRIOR TO THE PANDEMIC, THE COURT WAS EXTREMELY SLOW TO MAKE CHANGES, BUT THE PANDEMIC FORCED MANY QUICK CHANGES ALONG WITH SIGNIFICANT INVESTMENT INTO NEW COURTROOM TECHNOLOGY. THESE SIGNIFICANT CHANGES ARE IMPORTANT TO DOCUMENT AND ANALYZE. THE GOAL OF THIS RESEARCH WAS TO COLLECT FIRSTHAND ACCOUNTS OF COURT ADAPTATIONS AND OPERATION THROUGHOUT THE PANDEMIC. INTERVIEWS WERE CONDUCTED OF VARIOUS PROFESSIONALS WITHIN THE COURT SYSTEM - AT THE STATE CRIMINAL COURTS - TO GATHER INFORMATION ON THEIR EXPERIENCES DURING THE PANDEMIC. DOCUMENTING HOW THE COURTS ADAPTED IS IMPORTANT FOR FUTURE EVENTS THAT MAY ALSO REQUIRE VIRTUAL COURT AS WELL AS FOR ANALYZING IF WHAT WAS CHANGED WAS EFFECTIVE AND FAIR.

COMMITTEE MEMBERS: ***LYNDSIE FERRARA, PH.D.***; PAMELA MARSHALL, PH.D.; BOBBI JO WAGNER, J.D.; MICHAEL MACHEN, J.D.; ROBERT SCHUPANSKY, J.D.

10:45AM KAYLA MASSARI

CHARACTERIZATION AND DETECTION OF SWIPE SAMPLED PEROXIDE-BASED EXPLOSIVE RESIDUES USING PAPER SPRAY IONIZATION-TANDEM MASS SPECTROMETRY (PSI-MS)

ORGANIC PEROXIDES ARE COMMON AGENTS IN IMPROVISED EXPLOSIVE DEVICES (IEDS) BECAUSE THEY ARE EASILY ACCESSIBLE AND SUSCEPTIBLE TO EXOTHERMIC REACTIONS DUE TO PEROXIDE BOND INSTABILITY. IEDS HAVE BEEN USED IN ACTS OF TERRORISM SUCH AS THE OKLAHOMA CITY BOMBING, AND DETECTING THE EXPLOSIVE COMPONENT IS NECESSARY TO IDENTIFY A PERPETRATOR WITH THE MEANS AND MATE IALS TO MAKE AN IED. A RELIABLE AND RAPID DETECTION METHOD FOR ORGANIC PEROXIDES USED IN IEDS IS OF INTEREST FOR THE ANALYSIS OF PRE- AND POST-BLAST RESIDUE IN FORENSIC INVESTIGATIONS. THE GOAL OF THIS PROJECT IS TO DETECT AND IDENTIFY PEROXIDE-BASED EXPLOSIVES USING PAPER SPRAY IONIZATION-TANDEM MASS SPECTROMETRY (PSI-MS). FOR EFFECTIVE DETECTION OF THESE COMPOUNDS, METAL-PEROXIDE COMPLEXES WERE GENERATED USING VARIOUS METAL CATIONS WITH A +1 CHARGE. FOR COMPARISON WITH PSI-MS, LIQUID CHROMATOGRAPHY-TRIPLE QUADRUPOLE-MASS SPECTROMETRY INSTRUMENTATION WAS USED TO DETECT THE EXPLOSIVES BECAUSE IT IS THE GOLD STANDARD IN FORENSIC CHEMISTRY.

COMMITTEE MEMBERS: ***MICHAEL VAN STIPDONK, PH.D.***; LYNDSIE FERRARA, PH.D.; TIM EVANS, PH.D.; SUSAN KLINE, M.S.

11:15AM ISABELLA HABERSTOCK

THE EXTRACTION AND IDENTIFICATION OF ILLICIT COMPOUNDS FROM BAKED GOODS USING PAPER SPRAY IONIZATION-TANDEM MASS SPECTROMETRY (PSI-MS)

COMPLEX BAKED EDIBLE MATRICES HAVE BECOME MORE COMMON METHODS OF CONSUMPTION FOR ILLICIT SUBSTANCES LIKE MDMA AND METHAMPHETAMINE, BUT THERE ARE MINIMAL STUDIES REGARDING THE RAPID DETECTION OF DRUGS IN BAKED EDIBLES. EXISTING RESEARCH FOR EXTRACTING SUBSTANCES FROM EDIBLES FOCUSES ON CANNABIS, AND THE DEVELOPED EXTRACTION METHODS FOR THIS APPLICATION ARE COMPLEX AND REQUIRE MULTIPLE EXTRACTIONS TO OBTAIN A PREPARED SAMPLE. TO FILL THIS LITERATURE GAP, THE QUECHERS (QUICK EASY CHEAP EFFECTIVE RUGGED SAFE) DISPERSIVE SOLID PHASE EXTRACTION METHOD WAS COUPLED WITH PAPER SPRAY IONIZATION-TANDEM MASS SPECTROMETRY (PSI-MS) TO CREATE AN OPTIMIZED AND RAPID EXTRACTION AND DETECTION METHOD FOR ILLICIT SUBSTANCES IN EDIBLES. PSI-MS IS AN AMBIENT IONIZATION METHOD THAT HAS PRODUCED ACCURATE QUALITATIVE DATA FOR DRUG DETECTION STUDIES, AND IT WAS COMPARED TO THE GOLD STANDARD FOR DRUG DETECTION STUDIES, LIQUID CHROMATOGRAPHY-TRIPLE QUADRUPOLE-MASS SPECTROMETRY. THIS RESEARCH WILL CONTRIBUTE TO THE FUTURE IMPLEMENTATION OF QUECHERS AND PSI-MS IN CRIME LABORATORIES.

COMMITTEE MEMBERS: ***MICHAEL VAN STIPDONK, PH.D.***; LYNDSIE FERRARA, PH.D.; HANNAH ZIMMERMAN-FEDERLE, M.S.; STEPHANIE WETZEL, PH.D.

11:45AM CHRISTOPHER FARMEN

DETECTION OF DRUG SPECIES IN SURGICAL MASKS USING PAPER SPRAY IONIZATION – MASS SPECTROMETRY WITH A SIMULATED BREATHING APPARATUS

CONTROLLED SUBSTANCE CASES MAKE UP AN ALARMINGLY LARGE PORTION OF BACKLOGGED REQUESTS IN THE UNITED STATES. THIS ISSUE PROCLAIMS THE NEED FOR A TIME-EFFICIENT METHOD IN ILLICIT SUBSTANCE DETECTION. BREATH CONDENSATE ANALYSIS IN SURGICAL MASKS PROVIDES AN INEXPENSIVE AND QUICK TESTING METHOD TO DETERMINE DRUG PRESENCE. A SIMULATED BREATHING APPARATUS (SBA) WAS CONSTRUCTED TO DEPOSIT DRUG SOLUTIONS ONTO SURGICAL MASKS. SAMPLES WERE TESTED THROUGH PAPER SPRAY IONIZATION – MASS SPECTROMETRY (PSI-MS) TO DETERMINE DRUG IDENTITY FROM SIMULATED BREATH CONDENSATE. ILLICIT SUBSTANCES WERE DETECTED THROUGH PSI-MS BY COMPARING EXPERIMENTAL SPECTRA TO COLLISION-INDUCED DISSOCIATION (CID) REFERENCE FRAGMENTATION PATHWAYS. ADDITIONALLY, QUANTITATIVE RESULTS WERE COLLECTED VIA LIQUID CHROMATOGRAPHY – TIPLE QUADRUPOLE – MASS SPECTROMETRY (LC-QQQ-MS). THESE RESULTS SIGNIFIED THAT DRUG SPECIES CAN BE QUANTIFIED ACCURATELY IN PHYSIOLOGICAL AMOUNTS. THIS EXPERIMENT PORTRAYS BOTH TARGETED AND NON-TARGETED CAPABILITIES IN MASS SPECTRAL TESTING OF CONTROLLED SUBSTANCE EVIDENCE IN ARTIFICIAL BREATH CONDENSATE SAMPLES.

COMMITTEE MEMBERS: ***MICHAEL VAN STIPDONK, PH.D.***; STEPHANIE WETZEL, PH.D.; LUKE METZLER, PH.D.; ASHLEY EBERT, PH.D.

12:15PM ERIKA SOBOL

COMPARISON OF EXTRACTION METHODS FOR METHAMPHETAMINE AND METABOLITES FROM VITREOUS FLUID VIA LCMS/MS-QQQ ANALYZATION

AN EFFICIENT WAY TO EXTRACT AND QUANTIFY METHAMPHETAMINE (MAMP) AND ITS METABOLITES, AMPHETAMINE (AMP) AND PARAHYDROXYMETHAMPHETAMINE (PMAMP), HAS NOT BEEN DEVELOPED FOR VITREOUS FLUID VIA LIQUID CHROMATOGRAPHY MASS SPECTROMETRY (LCMS/MS-QQQ) ANALYZATION.VITREOUS FLUID IS THE MATRIX OF CHOICE DUE TO ITS ABILITY TO RETAIN DRUG CONCENTRATIONS AND ITS RESISTANCE TO DECOMPOSITION. THIS STUDY IS FOCUSED ON MULTIPLE EXTRACTION TECHNIQUES, LIKE SOLID PHASE EXTRACTION AND QUECHERS, TO ISOLATE MAMP, AMP, AND PMAMP FROM VITREOUS FLUID. THESE METHODS ARE THE POINT OF COMPARISON FOR EFFICIENCY AND RECOVERY OF THE DRUGS WHICH IS ANALYZED VIA THE LCMS/MS-QQQ. QUANTITATIVE ANALYSIS METHODS WERE EMPLOYED TO COMPARE EACH EXTRACTION METHOD'S RESULTS TO EACH OTHER TO DETERMINE WHICH WOULD BE THE MOST USEFUL TO EXAMINE MAMP, AMP, PMAMP. FUTURE RESEARCH NEEDS TO BE FOCUSED ON LOW COST, EFFICIENT APPROACHES TO TEST FOR MAMP, METABOLITES, AND OTHER DRUGS IN VITREOUS FLUID.

COMMITTEE MEMBERS: ***STEPHANIE WETZEL, PH.D.***; HALEY BERKLAND, M.S.; FREDERICK FOCHTMAN, PH.D.; ASHLEY EBERT, PH.D.

1:45PM JENNA HAMILTON

THE DNA ANALYSIS OF THE HUMAN TISSUE LEACHING FROM DIFFERENT SOIL DEPTHS

DECOMPOSITION OCCURS IN EVERY LIVING THING AFTER DEATH. WHEN A BODY IS BURIED, THE DNA WILL LEACH INTO THE SURROUNDING SOIL. THE ANALYSIS OF DNA LEACHING INTO SURROUNDING SOIL CAN HAVE MULTIPLE IMPACTS ON THE FORENSIC SCIENCE COMMUNITY. GIVEN THERE ARE METHODS TO FIND A BODY BURIED UNDERGROUND, SUCH AS GROUND-PENETRATING RADARS AND CADAVER DOGS, THERE ARE NOT MANY WAYS TO QUANTIFY IT. DETERMINING A TREND WITHIN VARIOUS DEPTHS CAN HELP QUANTIFY THESE SUSPECTED BURIALS. IN THIS STUDY, HUMAN TISSUE WAS OBTAINED FROM A FOREARM BELONGING TO A 55-YEAR-OLD MAN. THE AMOUNT OF DNA LEACHED INTO THE SURROUNDING SOIL WILL BE ANALYZED BY BURYING THE TISSUE SAMPLES AT DIFFERENT DEPTHS USING LOAM SOIL AND GROW POTS. THE SOIL WILL BE COLLECTED 4 TIMES USING A 4-FOOT CORING DEVICE. THE DNA WILL BE EXTRACTED USING THE DNEASY POWER SOIL PRO-KIT AND QUANTIFIED USING QPCR AND ANALYZED USING CAPILLARY ELECTROPHORESIS.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; ELIZABETH WISBON, M.S.; LISA LUDVICO, PH.D.

2:15PM WESLEY WAGNER

THE EFFECTS OF TEMPERATURE AND PRECIPITATION ON THE AMOUNT OF RECOVERABLE HUMAN DNA FROM SOIL DURING DECOMPOSITION

HUMAN DECOMPOSITION IS A FIELD THAT HAS BEEN GREATLY STUDIED, WITH MULTIPLE PROJECTS HAVING FOCUSED ON ANY NUMBER OF VARIABLES. HOWEVER, MUCH OF THIS RESEARCH FOCUSED ON THE RATES OF DECOMPOSITION. RATHER THAN FOCUSING ON THE DECOMPOSING REMAINS, THIS RESEARCH EXPANDS ITS INTEREST TO THE SOIL SURROUNDING THE REMAINS, SPECIFICALLY, THE POTENTIAL RECOVERABLE DNA. THIS RESEARCH FOCUSED ON TEMPERATURE AND SOIL MOISTURE, AND THEIR POTENTIAL RELATIONSHIP WITH THE AMOUNT OF RECOVERABLE DNA FROM SOIL DURING THE DECOMPOSITION PROCESS. THIS WAS DONE BY BURYING EIGHTEEN HUMAN TISSUE SAMPLES OF EQUAL SIZES INTO SEPARATE POTS AND ALLOWING DECOMPOSITION TO OCCUR OUTDOORS. AT PERIODS OF 2, 6, 8, 9, AND 10 MONTHS, THREE POTS WERE REMOVED AND THE SOIL DIRECTLY ABOVE, AROUND, AND BELOW THE TISSUE SAMPLES WAS COLLECTED. THE DNA WAS THEN EXTRACTED FROM THE SOIL, QUANTIFIED USING QUANTITATIVE POLYMERASE CHAIN REACTION (QPCR), AND GENOTYPED USING CAPILLARY ELECTROPHORESIS (CE).

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; LISA LUDVICO, PH.D.; SHEREE HUGHES, PH.D.

2:45PM LAUREN DANGEL

THE IMPACT OF EARTHWORM ACTIVITY ON THE MOVEMENT OF HUMAN DNA INTO SOIL

AFTER DEATH, DECOMPOSITION OF THE HUMAN BODY RELEASES CELLULAR CONTENTS INTO ITS SURROUNDINGS. DESPITE ADVANCES IN DEVELOPING DNA PROFILES FROM INSECTS, THERE HAS BEEN NO RESEARCH ON EARTHWORMS, AN ANNELID THAT LIVES IN SOIL AND DECOMPOSES ORGANIC MATTER. THIS STUDY DETERMINED THE IMPACT OF THE ACTIVITY OF THE EARTHWORM LUMBRICUS TERRESTRIS ON THE MOVEMENT OF HUMAN DNA DURING DECOMPOSITION. CADAVERIC FLESH WAS PLACED INTO A LOAMY SOIL CONTAINING EARTHWORMS. SAMPLES OF SOIL AND EARTHWORMS WERE COLLECTED OVER TIME. THE QIAGEN DNAEASY® POWERSOIL PRO AND BLOOD AND TISSUE KITS® WERE USED TO EXTRACT DNA CONTAINED WITHIN THESE MATRICES. THE QUALITY AND QUANTITY OF THE EXTRACTED HUMAN DNA WAS ASSESSED USING QUANTITATIVE PCR. THE EARTHWORMS AND SOIL WERE FOUND TO RETAIN A QUANTIFIABLE AMOUNT OF DNA, BUT THE QUANTITY AND QUALITY WAS NOT SUITABLE FOR DOWNSTREAM PROCESSING. THIS RESEARCH CAN LATER BE USEFUL IN IDENTIFYING CADAVERS AND ASSOCIATING CADAVERS WITH BURIAL SITES.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; PAMELA MARSHALL, PH.D.; JAMES KOTCON, PH.D.

3:30PM WILLIAM GIBBS

DEVELOPMENT OF A CONSERVED SEMENOGELIN I AND II EPITOPE FOR SEMEN IDENTIFICATION WITH RESPECT TO ALLELIC VARIATION

SEMINAL FLUID IS A SOURCE OF BIOLOGICAL EVIDENCE USED FOR DNA ANALYSIS. SEMEN IDENTIFICATION IS CRUCIAL IN SEXUAL-RELATED CASES. ACCURATE IDENTIFICATION OF SEMEN IS NECESSARY FOR EVIDENCE COLLECTION AND PRESERVATION. THE SEMENOGELIN PROTEINS ARE USED AS A MARKER IN SEMEN DETECTION ASSAYS. THEREFORE, SEMENOGELIN I (SEMG1) AND SEMENOGELIN II (SEMG2) WERE ANALYZED FOR ALLELIC VARIATION. THE ANALYSIS IDENTIFIED AN OPTIMAL PEPTIDE FRAGMENT (LJG) THAT WAS CONSERVED IN BOTH SEMENOGELINS, WITH LITTLE VARIATION. LJG WAS ASSESSED WITH THE CURRENT EPITOPE, THE SPMI FRAGMENT. THE ANALYSES DETERMINED THAT LJG WAS MORE EFFECTIVE IN MINIMIZING FALSE NEGATIVE RESULTS DUE TO ALLELIC VARIATION. LJG WAS CLONED AND EXPRESSED IN AN E. COLI SYSTEM. AFFINITY CHROMATOGRAPHY TECHNIQUES PRODUCED PURIFIED LJG IN PREPARATION FOR ANTIBODY PRODUCTION AS THE IDEAL EPITOPE. THIS STUDY SHOWED A MORE RELIABLE EPITOPE CAN BE PRODUCED FOR THE ANTIBODY-BASED SEMEN ASSAYS AND RECOMMENDS NEW ANTIGENS BE PRODUCED FOR SEMG1 AND SEMG2 DETECTION.

COMMITTEE MEMBERS: ***MICHAEL I. JENSEN-SEAMAN, PH.D.***; PAMELA MARSHALL, PH.D.; ELIZABETH WISBON, M.S.

4:00PM ABIGAIL MCNAMEE

ANALYSIS OF EIGHT LITHUANIAN TEMPORAL BONES WITH ANATOMICAL ABNORMALITIES AND SKELETAL EVIDENCE OF MIDDLE EAR INFECTIONS

RECENT RESEARCH HAS SUGGESTED THAT THE MASTOID TEMPORAL BONE IS ONE OF THE BEST PLACES TO RETRIEVE DNA IN HUMAN REMAINS DUE TO ITS ROBUST NATURE AND LACK OF MODIFICATION THROUGHOUT DEVELOPMENT. THERE IS NO UNIVERSAL TECHNIQUE FOR ANCIENT DNA (ADNA) EXTRACTION DUE TO DIFFICULTIES WITH DEGRADATION, CONTAMINATION, AND ENVIRONMENT. EIGHT LITHUANIAN TEMPORAL BONES WITH ANATOMICAL ABNORMALITIES FROM 200-400 AD WERE OBTAINED. THE GOALS OF THIS RESEARCH ARE TO USE ANTHROPOLOGICAL AND OSTEOLOGICAL TECHNIQUES TO ANALYZE THE BONE STRUCTURES, AND BE ABLE TO EXTRACT A USABLE DNA YIELD IN ORDER TO PERFORM NEXT GENERATION SEQUENCING AND GAIN INFORMATION ABOUT THE POPULATION. THE RESULTS OF THIS RESEARCH PROVIDE FURTHER INFORMATION ON MEANS OF ANALYSIS AND IDENTIFICATION OF SKELETAL REMAINS FOR THE FORENSIC SCIENCE FIELD. IT CAN BE APPLICABLE FOR EXTRACTING ANY HUMAN SKELETAL DNA THAT HAS BEEN COMPROMISED, CONTAMINATED, OR DESTROYED.

COMMITTEE MEMBERS: ***LISA LUDVICO, PH.D.***; KIRA HURLEY, M.S.; BOBBIE LEEPER, PH.D.; ALLISON GREMBA, PH.D.; ANNE BURROWS, PH.D.

4:30PM GRACE STOCKMAL

THE STUDY OF HYOID BONE FRACTURE PATTERNS

COMMONLY REFERRED TO AS THE "HANGMAN'S FRACTURE", THE HYOID BONE HAS BEEN OBSERVED TO BREAK WHEN COMPRESSED BY LIGATURES IN SUICIDAL AND HOMICIDAL DEATHS. PREVIOUS STUDIES HAVE DETERMINED DAMAGE AND FREQUENCY OF THYROHYOID FRACTURES, BUT SCIENTISTS NEED TO DEVELOP METHODS TO INVESTIGATE PATTERNS OF FRACTURE WITHIN THE HYOID BONE BY LIGATURE DEATHS. IT IS PROPOSED THAT HOMICIDAL STRANGULATIONS CAN BE ACCURATELY RECONSTRUCTED USING A 3D HYOID MODELS AND SIMULATIONS OF FRACTURE. TO TEST THIS PROPOSAL, HYOID BONES WERE COLLECTED FROM DECEASED INDIVIDUALS, CLEANED, AND 3D MODELS WERE MADE. THESE MODELS WERE SUBMERGED IN SKIN-LIKE COLLAGEN AND FRACTURED USING NYLON AND COTTON ROPES. FACTORS SUCH AS LOCATION OF FRACTURE, FORCE, AND DISPLACEMENT WERE MEASURED FOR EACH MODEL. THESE RESULTS WERE COMPARED TO CASE STUDIES OF HOMICIDAL STRANGULATIONS AND SIMILAR LITERATURE. FUTURE AUTOPSIES WITH UNIDENTIFIED MANNERS OF DEATH CAN INVESTIGATE THE HYOID BONE FOR PATTERNS OF FRACTURE THAT CORRELATE TO HOMICIDE.

COMMITTEE MEMBERS: ***PAMELA MARSHALL, PH.D.***; ROGER SHERMAN, M.S.; JENNIFER HAMMERS, PH.D.; JOHN VIATOR, PH.D.

CONCLUSION OF DAY 2.