Expedit ed DNA Analysis and Demographic Comparison of Evidentiary Samples from 1,785 Property Crime Cases

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Abstract
Property crime cases from Miami-Dade, Florida; Charleston, South Carolina; and Huntington, West Virginia were sent to the Marshall University Forensic Science Center (MUFSC). DNA analysis was performed for the CODIS hits that were received. The forensic science community will be impacted by this poster because it will provide the community with patterns and trends related to this property crime analysis. In this abstract, the project included 1,785 cases for a total of 2,496 questioned samples. This project currently includes 3,314 questioned samples as of October 1, 2012. After PCR, each questioned sample was analyzed; the resulting profiles and reports were sent back to the originating jurisdiction. The DNA profiles were uploaded into CODIS and the results were tracked. As of September 1, 2012, across the three sites, the 1,077 questioned samples were separated into blood, saliva, and touch samples. It is important to note that different preservative testing for blood was utilized at each location; MUFSC did not perform any necrological testing. Placement of samples into each category is based on those presumptive tests. In total, 45% of the samples were blood; of those, 1,018 blood samples; 95% of the samples produced DNA profiles. Saliva samples constituted 12% or 378 of the questioned samples. Only five percent of the saliva samples produced DNA profiles. The remaining questioned samples, making up 59% or the total questioned samples submitted, were touch samples. Of the 1,664 touch samples submitted, 31% resulted in a DNA profile. This number was higher than expected; an elevated percentage of touch samples resulting in DNA profiles may be due to the fact that many of the samples were not of intact DNA.

Introduction
In 2010, there were an estimated 9 million property crimes offensed that occurred in the United States. The overall loss from the 2010 property crimes is estimated at 15.7 billion dollars.1 The National Institute of Justice (NIJ) identified a need for additional research to be conducted regarding Property Crimes. This project sought to identify the best practices for sample collection, processing of samples and identification of perpetrators. It was developed to aid in the processing of property crimes, an often under-reported category of crime. As a result, the intentions of this study also included assessing the resultant data and extrapolating any apparent trends that occur.

The definition of a property crime differs slightly based on location. The Uniform Crime Reporting (UCR) Program from the Federal Bureau of Investigation2 includes the offenses of burglary, larceny-theft, motor vehicle theft, and arson, among others. According to the South Carolina Legislative Council's Code of Laws, crimes against the property include, but are not limited to the following: arson, burglary, robbery, and larceny of a vehicle. West Virginia legislation in Chapter 61, Article 5 [Crimes Against Property] that arson, burglary, and larceny are considered property crimes. Property crimes are defined in the Florida Statute under Chapter 812.3 Total Criminal Defense, a website, stated burglary, robbery, larceny and theft, and arson are considered property crimes. Florida law defines burglary as entering a building or structure with the intent to commit a property crime. It is clear that the definition differs. MUFSC did not attempt to define property crime and did not turn down any submitted cases, but each jurist determined case submission. Technical specifications and a Memorandum of Understanding (MOU) were in place prior to the start of this project and did not include modifications to the normal procedures to account for low copy number samples.

The Urban Institute produced a research report in April of 2008 titled, "Crime and Justice in the U.S.: 2007." The report stated that crimes against the property included, but were not limited to the following: arson, burglary, robbery, and larceny of a vehicle. According to the South Carolina Legislative Council's Code of Laws, crimes against the property include, but are not limited to the following: arson, burglary, robbery, and larceny of a vehicle. Thus, the project focused on assisting the local police departments in crime detection.

Materials and Methods*

Miami-Dade, FL

- Extraction: Forenmax® DNA IQ™ on Beckman® Biomek® 2000, Qiagen® DNA Investigator® on Biomek® EZ2
- Quantification: Applied Biosystems® Quantifier® Human on Applied Biosystems® 7500 Real-Time PCR System
- Amplification: Applied Biosystems® AmpliFiler® Profiler Plus® and Applied Biosystems® GenePrint® PCR System 9700 Thermal Cycler
- Capillary Electrophoresis: Applied Biosystems® 3130 Genetic Analyzer, GeneMapper® ID
- Analytical Threshold (RFU): 100, 75 (respectively)
- Stochastic Threshold (RFU): 200

Charleston, SC

- Extraction: Forenmax® DNA IQ™ on Beckman® Biomek® 2000, Qiagen® DNA Investigator® on Biomek® EZ2
- Quantification: Applied Biosystems® Quantifier® Human on Applied Biosystems® 7500 Real-Time PCR System
- Amplification: Applied Biosystems® AmpliFiler® Profiler Plus® and Applied Biosystems® GenePrint® PCR System 9700 Thermal Cycler
- Capillary Electrophoresis: Applied Biosystems® 3130 or 3130 Genetic Analyzer, GeneMapper® ID
- Analytical Threshold (RFU): 150
- Stochastic Threshold (RFU): 200

Huntington, WV

- Extraction: Applied Biosystems® Quantifier® Human on Applied Biosystems® 7500 Real-Time PCR System
- Amplification: Applied Biosystems® AmpliFiler® Profiler Plus® and Applied Biosystems® GenePrint® PCR System 9700 Thermal Cycler
- Capillary Electrophoresis: Applied Biosystems® 3130 or 3130 Genetic Analyzer, GeneMapper® ID

*According to MUFSC Procedures Manual

Results

Abstract

Discussion

It was hypothesized that the number of blood, saliva and touch samples would be similar across each collection site. Figure 2 shows that while the number of blood samples was similar across the three sites, the highest percentage of DNA profiles were obtained from saliva. Touch samples resulted in 31% producing a DNA profile. Although it was expected that blood would produce the highest percentage of resistent DNA-profiles followed by saliva and then touch samples, it was not expected that 31% of the touch samples would return a DNA profile because the protocols were not modified for low copy number samples4. After additional examination of the samples present in this category, one could ascertain that the higher than hypothesized touch results were produced because many small DNA peaks were present. This finding agrees with the fact that are worn and in direct contact with a person's skin.

Each specific site determined their own number of samples submitted for analysis. Miami-Dade averaged 3.65 questioned samples per case. Charleston, South Carolina averaged 2.06 questioned samples per case submitted. Huntington, West Virginia averaged 2.19 questioned samples per case. No pattern was seen regarding the number of questioned samples submitted per case and the percentage of DNA profiles being produced. Submitting more or less samples was not as relevant to producing DNA profiles as the actual biological substances being sampled and submitted.

Out of the number of samples submitted, Miami-Dade, Florida had 56.5% of its submitted questioned samples result in DNA profiles. Charleston, South Carolina had the highest rate of DNA results at 62.07%. Huntington, West Virginia had the lowest amount of samples producing DNA profiles at 46.41%. When looking into the number of samples and types of samples submitted, Huntington has the lowest amount of cases and any DNA results. It also had the highest percentage of blood samples submitted in comparison to the other two sites. The percentages of the samples produced DNA profiles were based on the actual biological substances being sampled and submitted.

The literature cited below includes only those references that are directly related to this project. Each reference is in alphabetical order by author. This section will provide a discussion of the results obtained and the comparison to those of other studies. The data collected from each site will be discussed in the context of the data obtained from the other two sites.

Miami-Dade, Florida

- Miami-Dade County Commander Stephanie Stohlman and the Miami-Dade Crime Laboratory Department

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Miami-Dade, Florida:

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Literature Cited