Y19 The Prevalence of Male DNA Under a Female's Fingernails

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Learning Overview: After attending this presentation, attendees will understand that male DNA under a female's fingernails holds probative value in casework when a full Y-chromosomal Short Tandem Repeat (Y-STR) profile is obtained. When a partial Y-STR profile is obtained, it is typically due to deposit during everyday activities.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing how, through the results obtained in this research, fingernail evidence collection and DNA analysis of this evidence will be affected and led into a direction of optimization.

The frequency of finding a male DNA profile under a female's fingernails is currently unknown by the scientific community. When a victim comes into contact with a male assailant during a violent or sexual assault, DNA analysis is performed to find the presence of foreign male DNA on the victim. Evidence is collected with a sexual assault evidence kit, which includes cutting, scraping, or swabbing of the victim's fingernails. However, finding male DNA may not necessarily reflect the context of how the transfer occurred and may not be the profile of the assailant. Considering that the sensitivity of DNA methodologies has improved, DNA analysis may be detecting previously undetected DNA that is actually being transferred through casual contact. In addition, secondary and even tertiary transfer may be detected. Previous studies have shown that the origin of foreign DNA under fingernails can be associated to cohabitants. Assessing the random nature of male-to-female transfer throughout the day is the basis for this study.

Y-STRs were used for typing of detected foreign DNA. Female participants in this study either lived with or frequently encountered male individuals in their daily lives. All samples were collected via cutting with fingernail clippers. All nails from one hand were combined and analyzed together. The fingernails were stored in a microcentrifuge tube and kept at -20°C until the samples were extracted. Extraction was performed on the fingernails using a QIAamp® DNA Investigator® kit combined with the Lyse&Spin kit. Quantitation was not performed in this study due to the amount of male DNA being extremely low. Amplification was performed with the PowerPlex® Y23 system. Genotyping was performed using an Applied BioSystems® 3130XL and fragment analysis was performed with GeneMapper® IDX v1.5. The sensitivity was set to 50 Relative Fluorescence Units (RFUs), and anything detected below that was not included in interpretation. Fifteen females participated in this study, resulting in 90 samples that were analyzed. Of the samples tested, partial profiles were produced from single and multiple contributors. In some cases, profiles were linked to male cohabitants via reference profiles provided. When the male cohabitant profile was detected, most allele calls were linked back to that individual. Since only partial profiles were obtained in this study, it is hypothesized that full male profiles obtained during casework may be more indicative of close, immediate contact between the victim and their assailant. Also, since the male cohabitant profile contributed to most allele calls, any foreign alleles present should be carefully interpreted.

Fingernail Clippings, Y-STR, DNA