A66 Extraction Methods for Recovering Touch DNA

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Upon completion of this presentation, attendees will have an understanding of characteristics of touch DNA and current extraction methods. Attendees will be shown data comparing four common extraction methods for touch DNA. This evaluation of the different methods will be based on STR data quality, ease-of-use, time, and cost. Attendees will have a basis of which extraction method is best for recovering touch DNA and may be guided as to what method may be most appropriately implemented in their laboratory.

This presentation will impact the forensic science community by evaluating currently implemented methods when deciding which extraction method to validate for touch DNA analysis.

Crime scene investigators are collecting touch DNA samples more frequently to be submitted to forensic laboratories. With the development of new technologies in forensic laboratories, the number of casework samples submitted for touch DNA analysis has increased. This is due primarily to the investigation of property crimes, in which touch DNA is the predominant source of biological evidence. Touch DNA, defined as the transfer of shed DNA during physical contact between an individual and an object can be found in the form of shed skin cells, latent fingerprints, small quantities of saliva, or "wearer DNA" – composed of skin cells and sweat. Such samples are difficult to analyze due to the inability to see the shed skin cells or saliva which are left on objects during contact. Touch DNA samples typically have lower DNA yields than other body fluid samples. Due to the nature of these samples, an extraction method that maximizes recovery and minimizes further damage to the DNA would be most suitable. However, no consensus within the DNA community has been reached as to what extraction method is best for retrieving touch DNA/low-level transfer DNA. This study evaluated the performance of several common manual extraction methods for retrieving touch DNA from both porous (cigarette butts, white bond legal size paper, and worn cotton clothing; N=32) and nonporous substrates (plastic bags, aluminum cans, conical tubes, and desktops; N=44). These methods included Qiagen QIAamp®, Applied Biosystems Prepfiler™, Promega DNA IQ™, and traditional organic extraction. The goal of this study was to determine which of these extraction methods would provide the highest DNA yield, quality, and most successful STR profiles. Extraction methods were compared based on results obtained as well as overall costs, labor time, and ease-of-use. Results indicate that all methods are comparable to one another in total DNA yield and STR allele success. However, this study suggests that

DNA IQ™ may be a less suitable extraction method for touch DNA based on STR allele peak heights. QIAamp®, Prepfiler™, and traditional organic extraction had average STR allele peak heights that were two to three times higher that DNA IQ™, on average. Furthermore, QIAamp®, Prepfiler™, and traditional organic extraction methods perform comparably in all other measures of STR data quality, making them equally appropriate methods for touch DNA extractions. Although not statistically significant, QIAamp® produced more alleles on average than the other methods, when both porous and nonporous results were combined for STR allele success. In forensic casework, this could mean an additional one to two STR loci eligible for CODIS entry, which would also greatly improve the power of discrimination for statistical calculations. The data indicates that labs may need to consider other factors when selecting a DNA extraction method for touch DNA analysis. Evaluation of ease-of-use, time, and cost indicates that QIAamp® may be the best method for manual extraction of touch DNA samples. This information could be useful for forensic laboratories when evaluating currently implemented methods or when deciding which extraction method to validate for touch DNA analysis.

Touch DNA, Extraction Methods, Low Template DNA

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