B181 The Complexities of Interpreting DNA Evidence Obtained in an Uncontrolled Social Setting

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The goals of this presentation are: (1) to demonstrate how DNA transfer events may impact the analyst's understanding of the DNA evidence at the crime scene; and, (2) to illustrate the complexity in predicting handling order and mode of transfer (primary, secondary, or tertiary) in an uncontrolled social setting situation.

This presentation will impact the forensic science community by adding to a growing body of knowledge regarding transfer DNA.

Recent advances in DNA typing technology have allowed for the detection of DNA transferred to various everyday objects. As sensitivity in commercial Short Tandem Repeat (STR) kits increases, so does the potential for detecting and amplifying extraneous DNA. A thorough understanding of DNA transfer, including both the active and passive processes that can lead to DNA deposition as well as the various variables that can impact DNA transfer, can assist in the interpretation and explanation of DNA found on evidentiary items. As forensic DNA laboratories continue to see a rise in the number of transfer DNA samples submitted for analysis, studies of transfer DNA that aim to identify the limits of DNA transfer, that investigate the multitude of variables that impact transfer, and that further understanding regarding DNA data interpretation in various real-world settings add to expanding scholarship that can benefit the forensic science field.

This study expands upon an investigation of DNA transfer in a social setting conducted by Goray and van Oorschot.[1] Four participants handled previously sterilized plastic objects (a communal jug and four cups) with their dominant hand to simulate a social gathering involving beverages. The order in which participants handled each object was recorded to test the following null hypotheses: (1) secondary DNA transfer will not occur and will not be detected on dominant hands; (2) tertiary DNA transfer will not occur and will not be detected on the cups; (3) a mixed DNA profile from all participants will not be found on the jug handle; and, (4) the order of handling the objects cannot be discerned from the DNA data. Each of the objects and the dominant hands of the participants were swabbed to test for evidence of primary, secondary, and tertiary DNA transfer. The samples were amplified with the GlobalFiler™ Polymerase Chain Reaction (PCR) Amplification Kit and analyzed on an Applied Biosystems® 3130xl genetic analyzer. The Mixture Analysis Tool within GeneMapper® ID-X version 1.5 was utilized to facilitate data interpretation.

DNA was detected in 41 of the 45 samples (92%) collected in this study. Only 15 samples produced profiles that were suitable for comparison utilizing the laboratory's current interpretation guidelines. Of these, 80% were mixtures containing DNA from two or more individuals and 60% had identifiable major and minor contributors. In the set of samples taken from an individual's hand, where a major profile could be identified, the major profile was consistent with the individual. In the set of samples collected from objects, there was no discernable correlation between the profiles detected and the timing or the length of contact with the object. In other words, the major profile detected did not consistently correlate with either the last person to touch the object or the individual who maintained contact with the object for the longest period of time.

These results illustrate the complex nature of interpreting DNA transfer in a social setting. In this study, the objects were pre-sterilized, the order of handlers and length of contact was recorded, and the handlers' profiles were known; however, the order of handling could not be reconstructed from the DNA profile information. This study demonstrates the ease of DNA transfer in social settings, illustrates the difficulty in predicting mode of DNA transfer based on the DNA typing results, and highlights the difficulty in interpreting the genetic data when multiple transfer events have occurred.

Reference(s):

1. Mariya Goray and Roland A.H. Van Oorschot. DNA transfer during social interactions. *Forensic Science International: Genetics Supplement Series 4*. No. 1, (2013) doi:10.1016/j.fsigss.2013.10.052.

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