A194 An Evaluation of Environmental Interference for Low Copy Number DNA Analysis of Non-Discrete Samples

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After attending this presentation, attendees will gain an understanding of the quantity of background DNA found in a wide range of private and public access areas, as well as the areas which contain significant amounts of background DNA.

This presentation will impact the forensic science community by providing information on the levels of background DNA which may interfere with low copy number analysis.

New and improved technology in forensic DNA typing has allowed the detection and analysis of very low levels of nuclear DNA. However, for non-discrete samples, the ability to detect and analyze these low levels has been off-set by the potential for contamination. In non-discrete samples, the DNA of the contributor is in the form of a biological fluid stain deposited on a surface. Because there may already be skin cells and other sources of DNA left behind by previous contact, the collection of the stain from the surface has the potential to contain a DNA mixture. For large samples, this is generally not an issue, since the amount of DNA in the sample overwhelms the background DNA and interpretation is not difficult. For small and naturally low DNA concentration samples, which require specialized preparation and analysis, the presence of the mixture becomes much more obvious. Separation of the DNA profile of the contributor of the stain and interpretation is much more difficult, or potentially impossible.

An understanding of the normal background levels of human DNA which may be present, as well as knowledge of the surfaces and areas more likely to produce high levels of background DNA would be beneficial to those in the forensic community who perform low copy number analysis. These analysts would be able to better assess the potential for exogenous contamination in their samples once such data was available. Such data would also be useful in setting standards for the probative value of low copy number DNA for non-discrete touch samples. Similar studies for other fields have been conducted to determine background contamination of target analytes (e.g. ions associated with explosive residues that may also be found in the environment) and these studies have been used to direct the limits of detection for the analytical methods used to analyze them. Such a study has not been previously undertaken for human DNA.

In this study, replicate samples of background DNA were collected from a wide range of surfaces in private (residences) and public (government buildings, schools, malls, etc.) areas. These areas were designated as public or private, and high, medium, or low traffic, depending on the estimated number of people to come in contact with the surface per day. A minimum of ten different access areas were sampled for each category. Three samples were collected from each access area in three different locations. The samples were collected by swabbing a controlled area (one square inch) using a cotton swab moistened with distilled water. The swabs were extracted using a Chelex® resin extraction method, for which the average expected recovery of DNA was previously determined. The amount of DNA on the swabs was determined by real time PCR (rtPCR or qPCR) using an 82 bp amplicon *Alu* primer set. The average level of DNA was determined for each of the three swabbed areas in each location and a statistical comparison of the data was calculated to determine which areas are significantly more contaminated with exogenous DNA than others.

LCN DNA, rtPCR, Non-Discrete Samples

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