A30 A Step Toward the Development of Methods for the Analysis of Fingerprint DNA

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The goals of this presentation are to provide information about the components of a deposited fingerprint sample, and to discuss a technique for the generation of a positive control with analysis of the results.

This presentation will impact the forensic science community by providing basic information about the components of a touch DNA sample originating from a fingerprint, while also discussing and presenting methods for DNA analysis using the standard, widespread acceptance of such techniques.

"Touch DNA" is contained in the cells deposited by a person's physical contact with an object such as a hard surface, that is, the deposition of a fingerprint. Studies have shown that is it possible to amplify both mitochondrial and nuclear DNA from fingerprints, and this could provide valuable evidence in many circumstances. However, the biological origin of the DNA in fingerprints is not completely clear. It may arise from sources such as epithelial cells trapped in skin oils or from cell-free DNA found in body fluids. An elucidation of these mechanisms could prove invaluable in the forensic analysis of samples.

The goal of the project presented here was to study basic characteristics of deposited fingerprints to aid in the development of techniques for the collection and analysis of this touch DNA. The first step was the generation of a suitable positive control for use in the experiments. A quantifiable, non-variable sample containing DNA and other components that mimicked a fingerprint (i.e., deposited cells in a chemical matrix) was required. A simple, cost-effective technique was developed for the production of these controls. Briefly, the most abundant chemical components comprising a fingerprint were combined proportionally to make the "fingerprint solution." Buccal epithelial cells were collected and suspended in the fingerprint solution. They were treated to reduce clumping and counted in a hemocytometer. The number of cells was equated to the DNA content of the solution, which allowed a known quantity of DNA to be used as a positive control while retaining the chemical characteristics of a fingerprint.

The cell/fingerprint suspension was used two ways: (1) it was deposited on a hard surface and spread with the use of a small roller to mimic a fingerprint; and, (2) it was added directly to an extraction reaction to allow for an estimation of the number of cells lost during the deposition procedure. Early in the project, these control samples consistently showed extraction yields greater than 100 percent, indicating the need to more carefully examine the components of a body fluid extract, especially when it contains limited template DNA. In subsequent studies, the source of the DNA in each type of sample was considered. Origins of the DNA such as endogenous extracellular sources, contamination from various collection methods, and contamination introduced during the procedure were examined. The results will be discussed here and the procedures for the generation of a positive control will be presented.

Fingerprints, DNA, DNA Profiling

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