AN INVESTIGATION OF THE TRANSFER OF SALIVA-DERIVED DNA

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Current validated forensic DNA analysis techniques are capable of providing reliable genetic information from biological evidence with both a high power of discrimination and a high sensitivity of detection. In 1997, it was reported that objects handled by single individuals yielded profiles consistent with those of the handlers, while objects handled by multiple individuals produced a DNA mixture. Since then, "touch DNA" analysis, the examination of DNA transferred through contact, has become a subject of interest in the field of forensic genetics. Subsequent studies investigated primary transfer, i.e., events wherein DNA is directly transferred from an individual to an object or another individual. Other research has investigated secondary transfer, a variation of DNA transfer in which the original source individual does not make direct contact with the final recipient individual or object. Instead, DNA is transferred through an intermediary vector. Similar studies have found that certain individuals, termed "good shedders," appear to have a greater propensity for depositing DNA when touching an object, as measured by complete genetic profiles; others, described as "poor shedders," do not leave behind as much DNA. Such DNA transfer studies conducted thus far have focused mainly on the transfer of sloughed off epithelial cells from individuals' hands. This presentation will summarize and explain research that examined primary, secondary, and tertiary transfer events involving DNA originating from saliva, a commonly encountered body fluid. For the purposes of this research, routine human behaviors, such as licking one's thumb to turn the page of a book or placing a pen in one's mouth for a short period, were simulated to facilitate transfer. Four subjects took part in the study, and each transfer event consisted of multiple replicates. The effects of drying time, moisture, and surface composition were examined. DNA was extracted from the samples obtained in these trials, amplified via the polymerase chain reaction (PCR), and subjected to capillary electrophoresis for STR analysis. The results of the study agree with previous findings which indicate that the presence of moisture increases the efficiency of transfer. For instance, moisture applied to a thumb bearing dried saliva, to imitate sweat, resulted in an increased level of DNA transfer than observed when the thumb remained dry. The study results also show that a smooth non-porous surface serving as the primary substrate may raise transfer efficiency. This is indicated by the fact that DNA was sometimes recovered in greater quantities from the surfaces of pens, rather than the thumbs of subjects. Interestingly, previous transfer studies have found that the secondary depositor (the last individual to come into contact with an item) is usually the major contributor to the resulting DNA mixture. In fact, the first person to make contact has only been shown to be the major contributor when conditions have been contrived in which a "good shedder" serves as the primary depositor and a "poor shedder" serves as the secondary depositor. In contrast with these previous studies, the results of the research in this presentation indicate that when saliva is the source of the transferred DNA, the primary depositor is often the source of the majority of the DNA. Multiple trials conducted in this study provided results that support this conclusion. Given that saliva is a likely source of transferred DNA, the results of this study indicate that all individuals essentially can be considered "good shedders." This concept, coupled with the inherent uncertainty as to the means of DNA deposition in forensic samples, negates the relevance of shedder status consideration in low-copy number forensic analysis. This presentation aims to share these findings with the scientific community and to emphasize that caution should be exercised when inferring that the major component of a touched DNA sample was derived from the last person to come in contact with the item. ⌘