B120 The Reproducibility of Individual DNA Deposits Detected With Diamond Dye

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Learning Overview: After attending this presentation, attendees will have learned how differences in DNA shedding propensity can be tested using a nucleic acid stain and how stable individual shedding propensity is over multiple depositions.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by adding information on different approaches to test for shedding propensity. Data on individual variation of how much DNA is deposited via direct transfer informs expert opinions on transfer probabilities.

Contact traces are an important part of DNA casework in all crime laboratories and, with optimized recovery, detection, and interpretation methods, many samples now lead to positive associations to a person of interest. The probative value of these associations and the possibility of passive transfer need to be considered carefully. It has long been established that there is individual variation on how much DNA is left behind when touching an item and at least on scientific study on transfer via handshakes concluded that it was "the relative shedding ability" of the two volunteers that had the largest effect on whose DNA was detected.[1] In 2018, Kanokwongnuwut et al. published an elegant method for testing shedding variability.[2] This study aimed at reproducing their DNA staining/cell counting approach.

Volunteers were asked to deposit a left ring finger print on a clean glass slide, then wash their hands and, after waiting for 30 minutes while not touching anything, deposit a right finger print. Prints were stained with 20x Promega® Diamond™ Dye and read at the Fluorescein Isothiocyanate (FITC) filter setting (495nm excitation and 550nm emission) on a Nikon® Eclipse® E600 fluorescent microscope. Signal counts were scored at 100x magnification for three different 0.5 x 0.5mm squares. The method worked well and gave clear signals. Signal density for prints collected prior to handwashing (left ring finger) was often very high, which made counting difficult. This was not a problem for washed hands (right ring finger), where cell nuclei counts were much lower (average 24 +/- 14, n=10). Not unexpectedly, there was a lot of variation in cell counts between two independent collection events for the unwashed print; for ten volunteers, only four had counts within 20% of each other. Differences ranged from 8% to 81%. This was similar for washed finger prints, where only three data sets had a difference smaller than 20% and the range was 11%–105%. The latter was unexpected; after handwashing and not touching anything, cell counts should have been closer to each other. Ranking volunteers as heavy and low shedders produced similar results for both types of prints; the same three were the highest shedders and the same two the lowest, which means unwashed prints also represent shedder status. In conclusion: in our hands, the method was not as reproducible as described by Kanokwongnuwut et al., but showed a similar distribution of heavy, intermediate, and light shedders.

Reference(s):

1. Szkuta B., Ballantyne K.N., Van Oorschot R.A.H. Transfer and persistence of DNA on the hands and the influence of activities performed. *Forensic Sci Int Genet*. 2017;28:10–20.
2. Kanokwongnuwut P., Martin B., Kirkbride K.P., Linacre A. Shedding light on shedders. *Forensic Sci Int Genet.* 2018;36:20–5.

DNA Shedding, Contact Traces, Cellular Material

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