B9 Evaluating a Test for Shedding Propensity Using Tape Lifts From Different Skin Locations

Xiao Chen, BS, John Jay College of Criminal Justice, New York, NY 10019; Tebah Browne, MS, John Jay College of Criminal Justice, New York, NY 10019; Genevieve Trapani, BS, John Jay College of Criminal Justice, New York, NY 10019; Nicholas D. Petraco, PhD, John Jay College of Criminal Justice, New York, NY 10019-1007; Mechthild K. Prinz, PhD, John Jay College of Criminal Justice, New York, NY 10019*

Learning Overview: After attending this presentation, attendees will have learned about tape lifting as a method for individual shedding propensity determination.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing leads toward a standardized method to test shedding propensity that could be relevant in casework.

The shedding propensity of a person can assist data interpretation in casework when assessing the possibility of passive transfer for DNA analysis results. Szkuta et al. concluded that "the relative shedding ability" of the two contributors influenced the detection of DNA of both participants, and the DNA of a high shedder was detected both after active and passive transfer.[1] In some cases, a single-source DNA profile of a high shedder was generated from a surface after passive transfer.[2] This means that knowing the shedder status of a suspect will assist with case interpretation. Currently, there are different methods to look at shedding propensity, all based on evaluating palmar skin (finger) deposits, but there is no standardized method, especially for an uncooperative suspect. This project tested the feasibility of testing sebaceous skin for shedding propensity.

Eight different skin types and samples were collected from 15 males and 15 females over three non-consecutive days with D-squame adhesive tape disks; the samples were washed and unwashed fingers from both hands, toe, and sebaceous skin areas (arm, ear, and nape). Samples were extracted with the QIAmp® DNA Investigator kit and quantified with either Quantifiler® Trio or Human Plus (HP) kits. All samples were amplified using GlobalFiler® Polymerase Chain Reaction (PCR) amplification kits, typed on a 3500 genetic analyzer and evaluated for the presence of DNA mixtures. The quantitation values were then modified by subtracting the foreign DNA percentage. DNA concentrations for different skin sample types were log transformed and tested for Pearson r correlation values.

The neck area below the ears showed the highest average DNA concentrations over all three collections, followed by nape and unwashed fingers. DNA concentrations for washed fingers were always lower than for unwashed fingers for both hands. Arm and toe samples had the lowest average concentrations. The ear and arm samples showed the lowest variability across all three collections as measured through the relative standard deviation. Unwashed fingers had a lower relative standard deviation than the washed fingers. The toe sample set was the most inconsistent.

The DNA concentrations for different skin locations show different degrees of correlation. For palmar skin, washed and unwashed fingers show a strong correlation to each other. Comparing sebaceous to palmar skin, moderate correlations are shown in sample pairings of arm with right unwashed and washed fingers, and nape with right washed fingers. Only weak correlations were found for the sebaceous skin types to each other and for the toe samples.

Results confirms earlier data regarding a correlation between average DNA concentrations over all three collections for arm and finger samples. But looking at each individual collection, only one of three days showed moderate correlations. Donors did not easily fall into different shedding propensity categories. Individual DNA values showed a continuous distribution from low to high concentrations, except for the top two or three DNA concentrations. For left washed fingers these "high shedders" stayed the same over all three weeks, while right washed fingers showed some consistency, and the arm samples none at all. As of now, tape lifts from washed fingers seem to be a possible tool to determine shedding propensity and further work will be needed on sampling other areas.

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. *For Sci Int Genet. 2017; 28:10-20.*
2. Lowe, A., Murray, C., Whitaker, J., Tully, G., Gill, P. The propensity of individuals to deposit DNA and secondary transfer of low level DNA from individuals to inert surfaces. *For Sci Int 2002; 129:25-34.*

Tape Lifts, DNA Shedding Propensity, Reproducibility

*Presenting Author