B113 Standardizing Testing for DNA Shedding Propensity

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Learning Overview: After attending this presentation attendees will: (1) be aware of the impact of an individual's shedding propensity on their DNA transfer risk, and (2) have learned about a proposed method to test this for research and casework subjects.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a standardized test for shedding propensity that can provide crucial information for the assessment of secondary transfer risks. Implementing this type of testing in casework could support expert testimony in this area.

With the majority of DNA casework now consisting of contact DNA traces, the distinction between active versus passive DNA transfer is important for the probative value of this type of evidence. A recent paper on transfer via handshakes concluded that it was not different preceding activities but "the relative shedding ability" of the two volunteers that had the largest effect on whose DNA was detected.[1] Instances where passive transfer generates a single source profile but not from the person touching, can generally be explained by the detected DNA being from a high shedder.[2] This means, knowing the shedder status of a person of interest would greatly benefit evidence interpretation in a specific case. Published methods on shedder testing show a wide variability of parameters regarding touched substrate, duration and area of contact, time after handwashing, recovery techniques, and DNA extraction. The method tested here avoids deposit and recovery variation by using tape discs with a defined collection area and employs a widely available DNA extraction kit.

Samples were collected from male and female volunteers using hypoallergenic D-Squame adhesive tape disks (D100, CuDerm Corporation, Dallas, TX), and by having them touch a sterile 50mL polypropylene tube (Corning Falcon tubes, Corning, NY) for 15 seconds. Several sets of parallel samples from the same donor were collected for touched Falcon tubes and the following skin areas: fingers and thumbs 15 minutes after hand washing, thumbs without washing, lower inside arm, and back shoulder. The sebaceous skin areas were collected to test for a possible correlation to palmar skin. DNA was extracted using QIAmp DNA Investigator kits (Qiagen, Germantown, MD) and quantitated with Quantifiler Trio (Thermo Fisher Scientific Applied Biosystems, Carlsbad, CA).

As in previous studies, samples from male individuals contained on average more DNA than samples from females but also showed a larger standard deviation.[3] With the exception of shoulder samples, this difference was not statistically significant. Tape lifts from unwashed thumbs contained the most DNA, followed by fingers after handwashing without soap, and the shoulder area. Touched Falcon tubes yielded the least amount of DNA. Correlation testing between parallel samples showed a strong correlation between finger and thumb lifts from the same hand after washing. This demonstrates the reproducibility of the collection method. There was also a correlation between washed fingers and amount of DNA deposited on Falcon tubes, meaning tape lift results are representative of what would be left behind when touching an object. More samples will be needed to strengthen these conclusions. Another future research topic is the question, if a single collection event can truly detect an individual's biological shedder propensity, or if this is only a transient quality always dependent on daily activities and other circumstances.

Reference(s):

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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. *Forensic Sci Int.* 2002;129:25–34.
3. Lacerenza D, Aneli S, Omedei M, Gino S, Pasino S, Berchialla P, et al. A molecular exploration of human DNA/RNA co-extracted from the palmar surface of the hands and fingers. *Forensic Sci Int Genet.* 2016;22:44–53.

DNA Transfer, DNA Shedder, Tape Lifts