IMPROVED DNA SWABBING AND DNA RECOVERY FROM SWABS

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Forensic analysis of touch DNA (tDNA) has proven useful in providing leads on property crimes and other offenses among various law enforcement agencies. However, it is inherently challenging to obtain a satisfactory DNA yield and/or a full DNA profile from tDNA. The purpose of this study was to identify optimal swab material and swabbing media towards developing improved techniques for the recovery of tDNA. Cotton swabs are widely used for swabbing surfaces to recover tDNA in forensic applications; however, cotton swabs may entrap biological material within the cotton fiber network potentially hindering their release. Therefore, toward achieving the full release of collected cells from cotton swabs, cellulase enzyme treatment was added to the stain extraction buffer (SEB). Although cellulase could potentially facilitate release of collected cells from individual cotton fibers by digesting cellulase polysaccharide, the enzyme treatment showed no increase in DNA yield compared to SEB alone. Another approach evaluated was the use of *flocked* polyester swabs, which have a unique design that lacks an inner core that could potentially trap cells. To further assist in the release of cells, these swabs were also dissolved in the organic solvents utilized in the SOP extraction. Nonetheless, this approach did not increase DNA yield compared to the SOP.

An alternative polyester swab possessing a *weaved* design was also investigated in this study. This swab further utilized a distinctive push-off tip mechanism which eliminated the need to physically cut the swab head, thus conveying the additional advantages of convenience and of reducing the risk for contamination. These swabs outperformed both the cotton and the *flocked* polyester swabs with regards to SOP extraction. Further optimization was attempted for both the cotton and weaved polyester swabs with respect to the swabbing medium. Media tested included water, 2% SDS, PBS, PBS + 0.1% of Tween-20, PBS + 0.1% Triton X-100, 95% ethanol DNA, and dry swabbing. The results showed that DNA yields were highest with 2% SDS versus all other swabbing media for weaved polyester swabs. In same-media comparisons, weaved polyester swabs consistently yielded more DNA over cotton swabs.

Overall, these results suggest that the optimal approach for tDNA collection is *weaved* polyester swab with a 2% SDS swabbing medium. This method appears to improve DNA yields from the limited amounts of available DNA which is common with tDNA.