IMPROVING DNA RECOVERY WITH POLYESTER SWABS AND SDS

Christina S. Chang[1], Megan E. Grimes[1], Leah Willis[2], Jodi Irwin[2],
Tamyra Moretti[2], Susannah Kehl[3], and Mark F. Kavlick[1]

[1]Counterterrorism and Forensic Science Research Unit, Scientific Analysis Section and
[2]DNA Support Unit, [3]Biometrics Analysis Section,
Laboratory Division, Federal Bureau of Investigation, Quantico VA

"Contact" swabbing, a swabbing method to collect biological materials including skin cells from clothing, weapons and other various evidentiary items, are routinely performed in forensic laboratories. This method of collection is generally performed using cotton swabs, but the cotton fiber network may entrap and/or potentially hinder release of biological materials. These factors may be particularly critical for limited quantity and/or low quality DNA specimens. Thus, the focus of this study was to increase the recovery of DNA using an alternative swab material and swabbing media to more efficiently collect and release cells and/or DNA.

A polyester swab possessing a *weaved* design was investigated. Purified cell-free DNA was spotted onto an inert substrate and then collected using both cotton swabs and polyester swabs with various swabbing media: water, 2% SDS, PBS, PBS + 0.1% of Tween-20, PBS + 0.1% Triton X-100, and 95% ethanol, as well as dry swabbing (no medium). 2% SDS with polyester swabs showed highest DNA recovery in the media comparisons.

Additional experiments examined evidentiary-like items and focused on SDS as the swabbing medium. Blood was collected from glass and cotton sheet substrates using cotton and polyester swabs pre-moistened with water or 0.01%, 0.1%, 1%, 2%, and 5% SDS. The results showed that the polyester swabs outperformed the cotton swabs regardless of donor, substrate, or swabbing media. Statistical analyses revealed that on the glass substrate, polyester swabs wetted with water, 0.01% SDS and 5% SDS showed significantly higher recovery than cotton and water for all donors. On cotton sheeting, polyester swabs wetted with 0.01% SDS showed significantly higher recovery for all donors compared to cotton and water. Furthermore, in an effort to preserve evidentiary items swabbed in this manner and to assess whether such swabs can be stored without detrimental effect on DNA quantity and/or quality during prolonged contact, this study also examined the effects of SDS concentration and time of exposure on samples.

Overall, the results suggest that the optimal approach for collection of blood from glass and cotton sheets is a polyester swab wetted with 0.01% SDS as a swabbing medium. This combination may improve DNA collection onto and release from swabs thereby increasing interpretable profiles to assist in casework.