Technical Insights from the Philadelphia PD Office of Forensic Science MAAFS Presentation

Research completed by the Philadelphia PD Office of Forensic Science on the M-Vac was presented at the 2015 MAAFS conference in Cambridge, Maryland. A summary of that research and technical details pulled from the presentation are listed below.

- The M-Vac collected 180x more than the swab with dilute buccal cells on a porous, absorbent material
- It collected about 5x more on grab and touch scenarios
- It collected more DNA material than the swab when re-collecting from items that had been worn for 4 hours and had already been swabbed
- It is efficient at collecting from large items or surfaces

Below are the tests that were conducted. In all of the comparisons, the lab compared the M-Vac to the double swabbing technique. Seven tests in total were conducted.

1. Buccal cells on highly absorbent Texwipes (TX312) – One milliliter of buffer containing buccal cells was dispensed on the material with ten replicates
   o An average of 180 times more DNA material was collected by the M-Vac
   o The M-Vac profiles were all full balanced profiles whereas the swab profiles were partial or imbalanced
2. Wearer DNA – Five t-shirts and two baseball caps were worn for four hours
   o The M-Vac collected an average of 5.6 times more DNA material
   o The STR results between the M-Vac and the swab were similar
3. Wearer DNA with the M-Vac being used as a secondary collection method – Five t-shirts and two baseball caps were worn for four hours. They were first sampled with the double swab method followed by the M-Vac method
   o The M-Vac collected an average of 2.3 times more DNA material after swabbing
   o With one of the articles, a hat, the swab yielded a 2 allele partial and the M-Vac yielded a full profile consistent with the individual
4. Grab scenario – Three t-shirts worn by females and grabbed for 20 seconds by males – Right sleeve swab and left sleeve M-Vac
   o The M-Vac collected an average of 5.4 times more DNA material
   o The M-Vac profiles were mixtures including the known contributors
   o The swabs were cleaner profiles, but inconclusive 50% of the time

5. Transfer through fabric was evaluated – A Texwipe was touched on one side by a known female contributor and on the other side by a known male contributor with six replicates
   o There is some transfer, but the majority of the DNA came from the contributor
      ▪ On the female side –
         ▪ 3 times the female was either the single source or major contributor
         ▪ Once the male was the major contributor
         ▪ Once it was a mixture without a major
         ▪ Once it was an inconclusive mixture
      ▪ On the male side –
         ▪ 4 times the male was the major contributor
         ▪ Once the female was the single source contributor
         ▪ Once it was an inconclusive mixture
   o The testing was not conducted with the swab
6. Blind scenario #1 – Female grabbed from behind by a male. She struggles and gets away - One replicate
   o M-Vac picked up more DNA material
   o M-Vac yielded 4 contributors and the swab yielded 3 contributors
7. Blind scenario #2 – Female assaulted in bathroom. Male uses towel to dry his hands after washing them – One replicate
   o The M-Vac collected more material
   o Both methods yielded a single source male contributor
   o The M-Vac profile was more balanced

Availability of DNA material and absorbance, seem to play a role on ratios between the M-Vac results and swabbing results. The large difference between 180x and 5x may find some explanation in those two factors.

The ability to collect from porous and absorbent evidence items falls in line with some of the places were the M-Vac has had success in the real world. There have been profiles produced from collections from rocks, bricks, ropes, water soaked clothing, sweatshirts, cinder blocks, etc. All of those items represent absorbent materials or absorbent scenarios.

Possibly the most important finding of the study is the conclusion that the M-Vac gives evidence collection a second chance. When traditional methods fail to produce an actionable profile, the M-Vac can be used to collect from the item again with the possibility of collecting enough DNA to get a viable profile and move the case forward.