

## **IMPLEMENTING NANOFIBER MATERIALS FOR AUTOMATING DIFFERENTIAL EXTRACTIONS OF SEXUAL ASSAULT CASEWORK EVIDENCE**

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InnoGenomics Technologies LLC introduces SpermTrap™, a device which effectively separates sperm cells from the epithelial cell DNA in sexual assault evidence. We report a novel application of nanofiber technology for the differential extraction of sexual assault evidence. The differential digestion method contains numerous manipulations that can potentially result in low quality or mixture STR profiles that are frequently difficult to interpret. This problem is more pronounced in samples containing high epithelial to sperm cell ratios. We address these problems by utilizing the SpermTrap to effectively capture sperm cells, while enabling efficient flow through of digested epithelial cell DNA. This method provides an efficient, simple, and fast process which significantly increases a forensic laboratory's ability to obtain "clean" sperm fraction DNA profiles, while minimizing sample loss due to manipulations. The SpermTrap system provides a rapid, reproducible procedure that is easy to implement in a single-tube format on an automated hands-free robotic platform.

InnoGenomics in partnership with Hamilton Robotics has implemented the automated processing of sexual assault samples. The process can perform differential extraction of SAK in a high throughput manner, the system can accurately process 48 samples at a time resulting in 96 DNA extracts in one run.

The optimized process effectively recovered >80% of potentially recoverable sperm DNA from dried sperm cell swabs samples, in in-house studies. Furthermore, in dilution series testing of sperm (Neat-1:1000) on female buccal swabs, the SpermTrap recovered >200% more sperm DNA compared to the manual differential digest method. In samples with 1:180 M:F ratios on swabs, the SpermTrap was able to provide profiles with little female epithelial carryover (<9%) providing a male major contributor in the profile.

Utah BFS tested the manual system with mock samples and were able to obtain S-fraction DNA that could be interpreted in their workflow for STR profiles with major contributors. Utah BFS has developed a method to implement the entire process of extraction after evidence material has been excised on a Hamilton AutoLys Star Robotic System removing the potential for user error or contamination once processing has begun. The result of this evaluation of mock samples containing minimum sperm cells in presence of high ratio of epithelial cell and evaluation of the ability of the SpermTrap to produce easily interpretable male STR DNA profile will be presented.