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# Enhancing Success Rates in Sexual Assault Investigations with SpermX™ GenSpin™ Differential Extraction System

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## Introduction and Background

Sexual Assault Kits (SAKs) often yield only a CODIS eligible DNA profile in approximately 40% of cases, largely due to traditional differential extraction methods recovering just 5–20% of available sperm. SpermX™ GenSpin™, a novel extraction method, employs a nanofiber membrane that captures sperm cells while allowing digested non-sperm material to pass through. This approach has demonstrated up to a six-fold increase in sperm recovery compared to conventional techniques. By enhancing the yield of male DNA, SpermX™ can significantly improve the generation of probative DNA profiles, even in samples with low initial sperm content. The presentation will compare SpermX™ with a selective degradation differential extraction method (DNase method), highlighting its potential to improve case resolution rates, and ultimately contribute to more successful prosecutions and justice for victims.

## Objectives

The primary aim of this study is to evaluate whether SpermX GenSpin can significantly improve the success rate of obtaining CODIS profiles from SAKs. Specific objectives include:

- Comparing the performance of SpermX™ GenSpin™ with the DNase method.
- Assessing improvements in sperm recovery, profile completeness, and processing time.

## Materials and Methods

A comparative study was conducted on two cohorts: 165 SAKs that were differentially extracted using the standard DNase method and 48 SAKs that were differentially extracted using SpermX™.

The established workflow uses differential extraction followed by purification with the Maxwell® FSC DNA IQ™ Casework Kit.

DNA quantification was performed using Quantifiler™ Trio, and STR profiles were generated with the PowerPlex® Fusion 5C kit.

## Results

	DNase	SpermX
SAKs Tested	165	48
SAKs Positive for Male DNA	124	31
SAKs Positive for Male DNA Pct	75%	65%
CODIS Profiles	74	24
CODIS Profile/SAKs Tested	45%	50%
CODIS Profile/SAKs Positive	60%	77%

The SAK samples tested with SpermX™ generally had lower quantification values.

Overall, 11% more CODIS profiles were generated using SpermX™ compared to the DNase method.

For samples that were positive for Male DNA (Y-DNA screen > 0.005 ng/μL) there was a **30% increase in CODIS profiles generated.**

## Discussion

For SAK samples with sufficient male DNA during screening, SpermX™ significantly enhanced the chances of obtaining a CODIS eligible profile.

Performing differential extraction and purification with SpermX™ took slightly longer compared to DNase method with a total time averaging about 6 hours for SpermX™ and 4 hours for DNase method.

Because DNase method employs selective degradation, it more effectively reduces female DNA carryover; consequently, although SpermX™ yields more CODIS profiles, it also leads to more samples requiring mixture deconvolution.

## Conclusion

Overall, our comparative study demonstrated that SpermX™ GenSpin™ can potentially increase the likelihood of obtaining CODIS eligible profiles by as much as 30%. These improvements have the potential to greatly enhance case resolution and deliver greater justice for victims.

Future studies will focus on automating the method to improve sample throughput and further refining and optimizing the procedure.

We will also evaluate utilizing probabilistic genotyping software to reduce time needed for mixture deconvolutions.