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Summary of Experiments Investigating the Impact of Fingerprint Processing and Fingerprint Reagents on PCR-based DNA Typing Profiles

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Introduction and Methods

This experiment looked at the impact of single and multiple reagents on the ability to obtain a PCR-based DNA profile from single, bloody fingerprints. Bloody fingerprints were made and given to staff in the Latent Print Unit. These prints were made on a variety of different substrates. These substrates were both non-porous and porous and included the following objects: newspaper, paper, plastic bags, aluminum cans, glass, duct tape and wood/metal knives. In addition, skin prints were made on the adhesive side of duct tape and subjected to various fingerprinting reagents. Latent Print Unit staff performed the fingerprint processing work using the following reagents:

Un-du
Un-du + Ninhydrin
Physical Developer
Ninhydrin
Vacuum Metal Deposition
Amido Black
Amido Black+ Leuco Crystal Violet
Leuco Crystal Violet
Genetian Violet
Cyanoacrylate + Sudan Black
Cyanoacrylate + Rhodamine 6G
Cyanoacrylate + Rhodamine 6G + Powder
Cyanoacrylate + Rhodamine 6G + Vacuum Metal Deposition
Stickyside Powder
Un-du + Stickyside Powder

The processed prints were then returned to CCI staff. CCI staff extracted, quantitated, amplified and typed the DNA from each of the processed bloody prints.



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Results

Although the use of the fingerprint reagents resulted in a loss of DNA from the bloody prints compared to the untreated, bloody control prints, DNA profiles were obtained in 30 out of 31 test samples. The DNA yield from the treated bloody prints was often very low or non-detectable. This result was probably influenced by the low sensitivity of the quantitation test used in this study. However, these low DNA yields did **not** prevent complete typing profiles from being obtained from the processed prints. Of the 31 bloody prints that were processed for fingerprints in this study and typed for DNA, **DNA profiles were obtained for 30 out of 31 of these treated prints. The only reagents which appeared to have a pronounced negative impact on the ability to obtain a PCR-based DNA profile was the “Stickyside” powder reagent in combination with the “Un-du” reagent. Although it was still possible to obtain a borderline profile with the “Stickyside” powder reagent by itself, when the “Stickyside” powder reagent was used in combination with the “Un-du” reagent, no DNA profile was obtained.**

Conclusions

There are several conclusions that can be drawn from this work:

- ❖ The vast majority of the fingerprint processing techniques do **not** preclude the ability to obtain a complete STR profile on a single, bloody fingerprint
 - The exception to this generalization is the fingerprint processing technique that utilizes “Stickyside” powder. No DNA profile was obtained from a print placed on the adhesive side of duct tape and treated with the “Stickyside” powder reagent and the “Un-du” solution.
 - If it is important to obtain a DNA profile, do **not** process the item using “Stickyside” powder and “Un-du”.
- ❖ Less DNA was recovered from processed, bloody fingerprints than from untreated bloody fingerprints.
 - Often times, very little DNA was recovered.
- ❖ The minimal amount of DNA recovered from processed bloody prints will likely mean that, most of the time, the entire extracted sample will be required to obtain a DNA typing result.



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- ❖ Since it is clear that DNA is lost during fingerprint processing, the best approach to obtaining **both** a fingerprint **and** a DNA result may be to **select the best fingerprint processing technique with the fewest reagents/steps.**