B56 Optimizing a Sequence of Methods for the Development of Latent Fingerprints on Thermal Paper

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After attending this presentation, attendees will be more knowledgeable regarding the best techniques that are currently available to process fingerprints on thermal paper. Attendees will understand the difficulties of working with thermal paper, how well current methods work, and how methods compare to each other.

This presentation will impact the forensic science community by illustrating what current techniques work the best with thermal paper substrates. This presentation will provide information on how well current thermal paper processing techniques work, separately and in sequence, as well as whether any methods stand out in terms of accuracy, consistency, and ease of use.

Thermal paper has been known to be a tedious substrate in latent fingerprint laboratories. Although it is considered a porous substrate, techniques that are commonly used to develop fingerprints on porous items have shown to be unsuccessful on thermal paper. A major issue is that chemicals used in these processes, as well as the common application of heat, can interact with the components of the paper, activate it, and darken the entire surface. The darkening of the paper makes the visualization of existing latent fingerprints a difficult task. Recently, numerous procedures have been created to successfully develop fingerprints on thermal paper evidence without interacting with the thermal properties. For other porous substrates, a sequence of methods may be followed to ensure that all existing fingerprints have been found' however, since thermal paper requires special techniques, a known sequence does not currently exist and laboratories may only utilize one method. If a latent fingerprint examiner solely uses one method for thermal paper evidence, the examiner may be unaware of fingerprints that were present but failed to develop. The examiner may also be unaware that a combination of these methods may yield better results than one method alone.

The goal of this study was to determine if a sequence of current processing techniques (1,2-indanedione with zinc chloride, PDMAC® paper, muriatic acid fuming, application of heat, and ThermaNin®) could be optimized to allow an analyst to state with confidence that all existing fingerprints have been found.

Nine sequences were created from the combination of the five methods previously mentioned. Each sequence was performed on known fingerprints that were 4 weeks, 3 weeks, 2 weeks, 1 week and 24 hours old. It was found that three out of the five techniques (1,2-indanedione with zinc chloride, PDMAC® paper, and ThermaNin®) developed fingerprints on both the thermal and non-thermal sides of the paper. It was found that 1,2-indanedione with zinc chloride and PDMAC® paper developed the highest number of fingerprints consistently. In many cases, treatment with PDMAC® paper directly after 1,2-indanedione with zinc chloride seemed to allow visualization of additional prints and enhanced fluorescence. This modified method was then applied to real receipt samples that were treated as mock evidence. In most cases, the same results occurred after treatment with 1,2-indanedione with zinc chloride and PDMAC® paper, but there were some samples where an additional latent print was seen after PDMAC® paper treatment. Lastly, it was studied whether magnetic powder, a common starting point in latent print processing sequences, interferes with other techniques. Fingerprints were developed with either plain black

magnetic powder or fluorescent magnetic powder, followed by additional processing by either 1,2-indanedione with zinc chloride, PDMAC® paper or ThermaNin®. The only method that showed additional fingerprint development was 1,2-indanedione with zinc chloride on non-thermal side fingerprints previously developed with plain magnetic black powder; however, the black magnetic powder hindered the fluorescence.

In conclusion, the use of 1,2-indanedione with zinc chloride and PDMAC® paper allowed the highest number of prints to be visualized. In some cases, combining these two methods allowed previously missed fingerprints to be visualized. These worked best when other techniques were not previously used. These techniques were simple, required little preparation, and could be left alone to develop while performing other tasks. The use of either of these two methods alone would be sufficient on thermal paper samples, but using them in sequence may increase the likelihood that all fingerprints present have been found.

Thermal Paper, 1,2-Indanedione, PDMAC® Paper