B92 An Evaluation of Five Methods to Develop Latent Prints on Thermal Paper

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Learning Overview: After attending this presentation, attendees will understand the additional difficulties thermal paper poses to latent fingerprint development, current development methods used, as well as benefits and drawbacks of these methods.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing further information concerning the development of latent fingerprints on thermal paper. Specifically, five development methods will be discussed: sequential application of 1,2-indanedione and ninhydrin, heat methods (oven, hot water immersion, and hairdryer), and p-Dimethylaminocinnamaldehyde (PDMAC) paper. These methods will be quantitatively and qualitatively compared to determine if a better method of development than those currently used exists.

Thermal paper, a type of paper that produces black or colored print in reaction to the application of heat, is commonly used for shop receipts, bus tickets, ATM receipts, and other applications. In the context of forensic science, the visualization of fingerprints on these receipts can connect possible suspects to a crime scene or time of evidence. Typical analysis of paper evidence involves ninhydrin and/or 1,2-indanedione dissolved in a polar solvent such as acetone or ethyl acetate, respectively; this poses a problem with thermal paper, however, because polar solvents dissolve the developer and allow it to react with the leuco dye to turn the paper black. These processes are often followed by the application of heat, which further activates the dye. If thermal paper turns black from these undesirable reactions, not only are the fingerprints less likely to be visible due to the loss of contrast, but the evidentiary print on the receipt may be lost entirely.

This experiment has two main components: analysis of fingerprints experimentally deposited on receipts and fingerprints naturally occurring on receipts. In the first part of the experiment, ten receipts from Kroger® and ten receipts from Costco® Wholesale were subjected to each development method. Results were photographed and rated (using a five-point quality scale) by three individual examiners. Statistical analyses used to determine the methods offering the most promising results were then applied to receipts with naturally occurring fingerprints. This ensured that the processes were effective at developing imperfect prints of varying ages.Preliminary results suggest PDMAC paper as an effective substitute for current methods since, unlike ninhydrin, no background darkening of the receipt paper is produced. The process itself is simple, although the receipts must remain sandwiched between the impregnated paper for 30 minutes to 24 hours; this time requirement, while lengthy, is comparable to the current 1,2-indanedione and ninhydrin time commitment. The resulting fingerprints are also comparable in quality to those visualized with 1,2-indanedione. In contrast, fingerprints developed from the other methods were not of high quality, if detected at all.

Future research should be conducted into PDMAC paper's specific mechanism to determine the length of time receipts should be sandwiched to produce the best visualization of the fingerprints. With this knowledge, the overall ease and effectiveness of developing latent prints on thermal paper will be improved, thus leading to more accurate comparisons.

Latent Prints, PDMAC, Thermal Paper

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