B161 Accelerated Development of Latent Prints on Thermal Papers

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Learning Overview: The goal of this presentation is to demonstrate how heat and humidity can be judiciously applied to accelerate the development of latent prints on thermal papers without sacrificing print quality.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by debunking commonly practiced traditions that any application of heat or humidity will negatively affect thermal papers and thus enable forensic examiners to more expeditiously develop latent prints.

Latent print development on thermal paper is a time-consuming task for latent print examiners. Development methods applied to non-thermal papers have historically been modified for thermal papers. The addition of heat on thermal papers has been widely discouraged because the dyes in the active layer of thermal paper (commonly leuco dyes) change color in the presence of heat, acids, and electron-accepting compounds.[1]

Generally, latent prints on thermal papers are developed over 24 hours in the dark under laboratory environmental conditions.[2-4] However, some research has promoted the use of heat to preferentially develop a latent print on thermal paper using various tools, including a hairdryer, a metal press called the Hot Print System, and heated solid chemicals (i.e., 1,2-indanedione and zinc-chloride).[5,6] Consequently, it may be concluded that heat above ambient laboratory temperatures can aid in developing latent prints on thermal papers.

The goal of this work was to determine whether the use of heat and humidity via a humidity chamber can be used to accelerate the development of latent prints on thermal papers similar to how non-thermal papers are treated. The application of heat and humidity was evaluated for the accelerated development of prints using common porous substrate staining solutions, including 1,2-indanedione, ninhydrin, and 2-isononylninhydrin (i.e., Thermanin).

Fingerprints from multiple donors (n=20) on a comprehensive range of thermal papers (n=13) were developed using 1,2-indanedione, ninhydrin, and Thermanin. The quality of prints were measured using Universal Latent Workstation's (ULW's) LQ Metrics overall clarity score as well as scoring by five trained latent print examiners using unenhanced grayscale images. It was determined that heat (50°C) and humidity (60%RH) could be applied to thermal paper without inducing discoloration. Additionally, the prints developed using the aforementioned accelerated method (20min) were generally equal to or higher in quality than those produced over 24hrs under ambient conditions. These same findings held true for prints aged and tested out to 30 days post-deposition. Additionally, a thermal probe was developed to more accurately categorize the thermal sensitivity of thermal papers and thus screen new evidence for method compatibility. In summary, this technique successfully accelerated the development of latent prints on thermal papers from 24hrs to 20mins, thereby expediting evidence processing for any of the three processes without compromising the overall quality of the developed prints.

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