B18 Comparison Between Physical Developer Detergent Solutions

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After attending this presentation, attendees will learn about the similarities and/or differences found among three different physical developer detergent solutions used in the forensic community. Also, it will be described how latent prints from ten different paper substrates were developed in order to determine how the latent prints are affected.

This presentation will impact the forensic community by determining any differences and/or similarities between three different physical developer detergent solutions currently used in the field. In addition, this work will inform latent print specialists of any problems that they may face when analyzing evidence on complicated paper substrates, such as brown kraft paper.

Physical developer has been utilized by fingerprint specialists to analyze the water insoluble components of a latent print since the mid- 1970s. Although the process is not completely understood, it has been found that not all physical developer formulations work the same. A physical developer solution is composed of three different solutions: a redox solution, a detergent solution, and a solution of silver nitrate. Although both the redox and the silver nitrate solutions are made from the same chemicals among labs, the origin or the detergent can vary. In this study, three different detergent solutions were evaluated.

Although it is not known what component of a latent print residue reacts with the silver in the physical developer solution, it has been determined that a chemical reaction between the two does occur. Once the sample is removed from the yellowish physical developer solution and rinsed with tap water, a grey to black fingerprint is left behind. Physical developer is often the last process that is used when analyzing a nonporous substrate, such as paper, due to the extent of the substrate background development. There are many cases in which the print is hard to view due to the substrate reacting with the physical developer solution.

In this study, latent prints were collected from eighteen different people, seven males and eleven females. These prints were deposited on ten different paper substrates: white photocopy paper, premium photocopy color photocopy paper, white legal pad paper, yellow legal pad paper, manila envelope paper, white envelope paper, green file folder paper, brown kraft paper, brown packaging paper, and newspaper. It was hypothesized that the prints would not develop to the same extent on each type of paper substrate due to the chemical differences in each paper type.

Three different physical developer solutions were made in order to serve as a representative sampling of the variety used in the field. One solution was made using a detergent containing Tween 20. Another solution utilized Synperonic N, while the last was made using Synperonic NP8. It was hypothesized that the Synperonic NP8 solution would not develop the latent prints as well as the other two solutions due to problems previously reported in the field.

The experiment was carried out dividing each latent print in half and processing each side using a different physical developer solution. Each half-strip was soaked in malic acid for fifteen to twenty minutes in order to remove as much calcium bicarbonate from the paper as possible. Next, the paper was processed using the designated physical developer solution for about fifteen minutes, followed by rinsing with tap water four times. The paper was dried by running the half-strips through an Arkay Stat-Dri dryer one time. The half-strips where then taped back together in order for comparison and photographing to be performed. Before the strips were divided, the moisture content was recorded in order to determine a difference, if any, on the results of the developed prints.

Results to date show that the Tween 20, Synperonic N, and Synperonic NP8 chemicals that are used in the differing detergent solutions of physical developer do not greatly affect the print, but differences were seen. It was determined that the Synperonic NP8 detergent developed the least amount of prints having good ridge detail among the three; however, it cannot be determined if it was the n- dodecylamine acetate or the syperonic NP8 that caused the variation. The greatest difference between the developed prints was seen in the substrate, proving our hypothesis to be correct. Moisture content was shown to have no effect on the development of the latent print.

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