D8 Comparison of Differential Processing Techniques for Development of Latent Prints on Porous Substrates

Marissa Olvera, BA, BS, 3203 Park Avenue Apartment C, Richmond, VA 23221*

After attending this presentation, attendees will become more informed regarding the performance of Oil Red O as a latent print processing reagent.

This presentation will impact the forensic community by providing additional instruction and information in the maximum development of latent prints.

Friction ridge skin forms on the hands and feet of a fetus in utero and the pattern produced is permanent unless altered as a result of injury or disease. The orientation, location, and relationship of ridge characteristics allow for individualization or exclusion of a fingerprint to its source. An impression of the friction ridge pattern can be transferred during contact with a surface, resulting in a latent print, if invisible to the naked eye.[1] Validation of the use of ORO in the development of latent prints on paper substrates, integration of ORO in sequence with other methods of fingerprint development and carrier solvent examination are important areas of research in latent print analysis. Investigation and optimization of the techniques used for the visualization of latent prints are essential to the successful contribution of latent print analysis in forensic science.

Latent fingerprints are typically composed of varying amounts of salts, amino acids, fats, oils, and waxes. Routine chemical processing techniques in the development of the water-soluble, amino acid component of latent fingerprints include DFO (1,8-diazofluoren-9-one) and ninhydrin (triketo-hydrindene hydrate).[2] The lipid components of latent fingerprints are routinely processed via Physical Developer (PD).[3] The use of Oil Red O (ORO), a lypophilic stain, has been established as being effective in the development of latent prints on paper substrates and as a possible replacement for Physical Developer (PD). Oil Red O (ORO) was evaluated as a latent fingerprint reagent on various paper substrates in comparison to PD and in sequence with DFO, 1, 2-IND and NIN. Performance of 1, 2-IND in contrast with DFO was also assessed. Amino acid based and sebaceous based fingerprints were deposited on nine paper substrates including book paper, sticky notes, brown paper, manila envelope, newspaper, notebook paper, copy paper, cardboard, and check paper. Upon development, each fingerprint was paired with its original partner and visually compared to determine the effect of carrier solvent on sebaceous print development. All comparisons were verified by a qualified latent print examiner at the Oregon State Police Forensic Services Division, Springfield. ORO was found to develop more latent fingerprints of better quality than PD solo and in sequence with other latent fingerprint reagents. 1, 2-IND was observed to have a positive effect on ORO development when used as a replacement for DFO. HFE-7100 was utilized as the carrier solvent for DFO, 1, 2-IND, and NIN as it was demonstrated that fewer fingerprints developed using PD. It is recommended that ORO should be used as a latent fingerprint reagent using the parameters described, in place of PD. HFE-7100 should be used in lieu of PD as the carrier solvents for amino acid based latent print reagents, DFO, 1, 2-IND, and NIN. When utilizing ORO for latent print processing, it is also recommended that 1, 2-IND should be used in place of DFO.

References:

1. Cowger, J. *Friction Ridge Skin: Comparison and Identification of Fingerprints*;CRC Press: Boca Raton, FL, 1993.
2. Wallace-Kunkel, C.; Roux, C.; Lennard, C.; Stoilovic, M. The Detection and Enhancement of Latent Fingermarks on Porous Surfaces-A Survey. *J. For. Ident*. **2004**, *54*(6), 687-705.
3. Hollars, M.L,; Schwartz, R.L.; Trozz T.A. *Processing Guide for Developing Latent Prints*, Federal Bureau of Investigation: Washington, DC, 2001.

Oil Red O, Latent Prints, HFE-7100

 ** Presenting Author*