A171 Assessment of Acidified Hydrogen Peroxide vs. Cyanoacrylate Ester/Rhodamine 6G Processing for Developing Latent Fingerprints on Brass Cartridge Cases

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After attending this presentation, attendees will have an understanding of the comparative performance of Acidified Hydrogen Peroxide vs. Cyanoacrylate Ester/Rhodamine 6G for developing latent fingerprints on brass cartridge cases.

This presentation will impact the forensic science community by discussing which processing method develops latent fingerprints with higher quality (Acidified Hydrogen Peroxide vs. Cyanoacrylate Ester/Rhodamine 6G).

Cyanoacrylate Ester (CA) fuming followed by Rhodamine 6G (R6G) fluorescent dye stain is a common processing technique for latent prints on non-porous evidence. The latent print residue will initiate the polymerization of the CA monomers forming a white, fibrous material thus developing the latent print. R6G fluorescent dye stain can then be applied which will absorb into the fibrous matrix of the CA polymer. The latent print can then be visualized at 532nm using a LASER or alternate light source. Another common method for developing latent prints, specifically on brass cartridge cases, is Acidified Hydrogen Peroxide (AHP). Fired cartridge cases typically appear dark in color due to the firing process. AHP will oxidize the brass cartridge case in all areas except where the latent print residue protects the brass resulting in a light colored appearance except in those areas below the latent print residue. The latent print can then be visualized under ambient lighting conditions. These two processes may also be used in sequence when processing cartridge cases (CA/R6G followed by AHP). Because AHP is an irreversible reaction, there may be a potential for the process to corrode the brass and interfere with forensic firearms examinations. Because of this, consideration should be given to determine the success of this technique over other non-destructive processing methods available. This research, therefore, seeks to understand the severity of potential corrosion to the brass and which of these processing methods (CA/R6G vs. AHP) develop latent prints with higher quality.

A total of 225 brass cartridge cases were used in this evaluation which was comprised of three different processing methods and using two types of latent print matrix standards (sebaceous and eccrine). One latent print was placed on each of the sixty 9mm cartridge cases, sixty .556 cartridge cases, and forty-five M16 cartridge cases using the sebaceous latent print matrix standard. Additionally, one latent print was placed on each of the sixty .556 cartridge cases using the eccrine latent print matrix standard. For each set of cartridge cases, one-third was processed with CA/R6G, one-third was processed with AHP, and one-third was processed with CA/R6G followed by AHP. All CA processing lasted approximately fifteen minutes followed by a ten minute vent sequence then rinsed with R6G. All AHP processing lasted until a latent print developed (range 29 – 75 seconds). All latent prints were photographed and the development times for all cartridge cases developed with AHP were recorded. Fifteen of each set of latent prints were digitally presented to a certified Latent Print Examiner for evaluation. The Latent Print Examiner rated the quality of development according to a numeric rating scale (0 to 5) corresponding to the quality of the friction ridges developed. Data was evaluated according to which processing method developed latent prints with higher quality, whether the results varied according to the type of cartridge case used, and whether the results varied according to the latent print matrix standard used.

Results indicate CA/R6G and CA/R6G followed by AHP consistently developed higher quality latent prints than AHP alone for all types of cartridge cases and latent print matrix standards ($p<0.001$). Statistical differences were observed between types of cartridge cases and the processing methods with CA/R6G developing higher quality latent prints on the M16 cartridge cases and AHP developing higher quality latent prints on both the .556 and M16 cartridge cases compared to the 9mm ($p<0.01$). The quality of latent print development for each processing method appears to be dependent on the type of latent print matrix with AHP developing higher quality latent prints using the sebaceous matrix and CA/R6G and CA/R6G followed by AHP developing higher quality latent prints using the eccrine matrix ($p<0.001$). Results also indicate no difference in the time of latent print development using AHP only vs. AHP following CA/R6G. Lastly, results indicate CA/R6G develops at a much quicker rate when using the eccrine matrix, but further research is warranted to better understand whether this time difference is significant. These results warrant further research to better understand how time and normal environmental degradation will impact the quality of the latent prints developed using these methods and using other types of cartridge cases.

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Forensic Science, Cartridge Cases, Fingerprint Development

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