E37 Evaluating the Effects of Heat on DNA Recovered From Friction Ridges Developed With 1,2-Indanedione (IND)

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Learning Overview: After attending this presentation, attendees will have a better understanding of the effect of heat on obtaining usable DNA from friction ridges following latent print processing. IND used to develop friction ridges on paper requires the application of high heat.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a greater understanding that using IND and heat to develop friction ridges on paper has no effect on subsequent DNA analysis. As a result of this testing, the forensic science community can benefit from knowing that evidence treated with IND can safely proceed from a friction ridge unit into a DNA unit for further analysis without hindrance.

Introduction: The development of friction ridge impressions on porous items, such as paper, is typically very successful because available techniques target the residues that rapidly absorb into the fibers of the paper, thereby protecting the impression from environmental interference. In addition to the friction ridge residue constituents, DNA is similarly co-deposited when paper is touched or handled. As potentially probative evidence, developing an identifiable fingerprint and DNA profile from the same piece of paper could be valuable, but it must be tested to ensure congruence among both forensic testing analyses. For downstream DNA analysis to be successful, the selected fingerprint development technique must not impede the upcoming biological testing. Current research suggests that a number of chemical enhancement methods, including IND, do not affect subsequent DNA testing, particularly with regard to fingerprints left in saliva or blood. However, there is little research available on the effects of heat in conjunction with IND on cell-free DNA deposits, or "touch" DNA. That is what was tested by this study.

Three fingerprints from 12 participants were deposited onto standard copy paper and the fingerprints were cut in half. Due to the variability of DNA present on friction ridges not only from person to person, but also from mark to mark, each fingerprint was compared to itself. One of the fingerprint halves for each of the three sets was left untreated to compare with the corresponding fingerprint half treated with IND and heat. The three treated fingerprint halves for each participant were subjected to the following heat tests: (1) IND reagent and no heat, (2) IND reagent and moderate heat (60°C), and (3) IND reagent and high heat (100°C). Following visualization and analysis of fingerprint value, the samples, both treated and non-treated (72 total), were cut into pieces and analyzed for DNA five days after being deposited.

Nine of the participants left enough DNA with the fingermarks to move past quantitation for Short Tandem Repeat (STR) analysis. These same participant fingerprints also moved past quantitation following IND and heat testing, having both high quantity and quality of DNA. There were no indications of DNA degradation due to the treatment. Three of the participants, however, initially left little-to-no DNA with their fingerprints, but the friction ridges, upon visualization, were high-quality marks. By looking at the developed print, there was no way to indicate whether DNA was co-deposited, because all fingerprints had high-quality, robust features after being processed with IND and heat.

Overall, it can be understood from this research that there is no significant impact on the quantity or quality of DNA following fingerprint development with IND and heat. Further research can be conducted to determine if there is an impact on DNA analysis after more than five days.

Indanedione, Latent Print Friction Ridges, DNA

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