D27 The Effect of Short Wave Ultraviolet Light on Latent Fingerprints

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The goals of this paper are to present to the forensic community the observed effect of short wave ultraviolet light on latent fingerprints.

This oral presentation will introduce observations of latent finger- prints on non-porous surfaces that received prolonged exposure to short wave ultraviolet light (254nm wavelength). It was hypothesized that effective documentation and recovery of latent fingerprints exposed to short wave UV light for 10 minutes or more may be inhibited due to a chemical breakdown in the protein compounds that compose friction ridge detail in latent fingerprints.

Background: During a project constructed to test the effectiveness of various forensic light sources on biological fluids, the friction ridge detail on latent fingerprints was observed to have darkened after exposure for approximately ten minutes to short wave (254nm) ultra- violet light. However, the shading of the prints, as observed and docu- mented by digital photography, was altered as the UV light was moved at different angles to the fingerprints over the course of the project. At the time, it was not possible to confirm if the darkened fingerprint detail was a result of exposure to UV light or if other factors came into play.

Experimental Method: Latent fingerprints were deposited on non- porous plastic and glass substrates and exposed to a 12-watt germicidal UV light source for up to 1 hour. The observed appearance of the test prints was documented and preserved over time using a forensic light source, video and digital photography. ISO 200 speed film speed was utilized with a shutter speed of one-fourth of a second. The f-stop range for the project was 4.0, 4.5, 5.0, and 5.6. In each series of photographs, only one f-stop setting was used to ensure consistency. Physical recovery of the test fingerprints was accomplished with black fingerprint powder and brush techniques. In all cases, control prints were deposited and recovered from the same or similar substrates using the above techniques.

A darkening of the ridge detail was observed on the latent prints deposited on the glass and plastic substrates after exposures to short wave ultraviolet light of 20 minutes or more. The darkening initially made the ridge detail more apparent, but slowly began to blur the fine edges and eventually led to some of the ridge patterns to appear that they had thickened and joined together. However, there was no readily apparent degradation when the fingerprints were recovered using powder-lift techniques. In every case, the powder-lifted fingerprints were suitable for examination and did not appear to have lost any fine detail.

The friction ridge detail of the latent fingerprints deposited on non- porous surfaces and exposed to short wave ultraviolet light for an extended period of time darkened to the point that photographic docu- mentation was adversely affected. These latent fingerprints were video taped and photographed in five-minute intervals for up to one hour, and gradual darkening and near obliteration of some of the friction ridge detail were documented. The cause of this darkening is unknown, but is hypothesized to be a result of deteriorating protein elements within the latent fingerprint due to prolonged exposure to short wave Ultraviolet light. However, since this darkening did not affect the powder lift method of recovery, it only appears to be problematic when the means of fingerprint recovery is exclusively video or photography. Furthermore, direct exposure to short wave ultraviolet light of more than
20 minutes is unlikely when processing fingerprints in the field. However, the findings reported here might be useful to forensics profes- sionals to prevent any hindering effects short wave ultraviolet light exposure may have on the photographic documentation of evidence.

Further Testing: The effects of short wave UV light remains of interest, especially with regard to protein compounds within fingerprint ridge detail. The project is currently being expanded to include obser- vations of the performance of protein reagents on latent fingerprints after exposure to short wave UV. Latent prints will be deposited on paper and will be chemically recovered using the protein reagent Ninhydrin. Additionally, latent prints will be exposed to other light sources to determine if radiated heat from normal household light plays some role in the observed darkening effect.

Short Wave Ultraviolet Light, Latent Fingerprints, Digital Photography

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