B79 The Effects of Ultraviolet (UV) Radiation on Time-Dependent Changes in the Composition of Latent Fingerprints

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After attending this presentation, attendees will understand how UV radiation affects the perceived age of latent fingerprints, with age referring to the time since the fingerprint was left on a surface.

This presentation will impact the forensic science community by providing fingerprint analysts with additional information to use when working a case. Previous research has been performed to determine the time since deposition of a fingerprint as well as the age of the fingerprint donor, but there are many environmental factors that have yet to be considered, with UV radiation being one of those factors. This information can be used to help investigators include or exclude fingerprints from a crime scene.

Fingerprint ridge patterns have been demonstrated to be unique to an individual for many years. While latent fingerprints found at a crime scene are useful in including or excluding an individual from being present at a crime scene, they currently provide little information without an exemplar fingerprint for comparison. Studies have been undertaken to determine if more information can be established from a latent print, such as characteristics of the person who left the fingerprints, as well as how long the fingerprint has been on that surface, also known as time since deposition. Current research suggests that the time since deposition can be determined under controlled laboratory conditions and also that the donor age can be determined to within five years for suspects more than 20 years old; however, there are many environmental elements that must also be considered for real-world application.

In this study, there are two variables: time since deposition and UV radiation levels. Ongoing research suggests that time-dependent changes in the fingerprint composition can be used to estimate the time since deposition in ambient laboratory conditions. For this study, UV radiation wavelengths were controlled to determine if UV radiation affects the time-dependent changes of the fingerprint composition. There were four time-since-deposition groups: one day, one week, one month, and four months. The ages used ranged from 18 years old to 24 years old. For this study, donor age was not a variable in order to achieve more specific results for the time since deposition. For each donor, 24 fingerprints were taken and divided into two trials of 12. Those 12 prints were further divided into the four time-since-deposition groups, with each group having three prints, one with no added radiation, one with added UVA radiation, and one with added UVB radiation. All prints were on the same surface: aluminum. The added radiation levels were controlled using UV lamps. This allowed for each print to only be exposed to the added radiation or not to be exposed to any radiation at all.

To determine if the UV radiation affected the time since deposition, the radiated fingerprints were compared with the non-radiated prints for the corresponding time-since-deposition group. After reaching the target time since deposition, the prints were tested using Fourier Transform Infrared Spectroscopy (FTIS) and Raman spectroscopy to determine the chemical composition of the fingerprint over time, followed by chemometric analysis to identify time-dependent changes in each fingerprint. These changes were then compared to ascertain the correlation between UV radiation and any changes in the time since deposition in the prints to which UV radiation was added.

Fingerprint, Time Since Deposition, Ultraviolet Radiation

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