B42 The Effects of Environmental and Atmospheric Conditions on the Longevity of Latent Prints

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After attending this presentation, attendees will learn about the effects of weather and humidity on the permanence of latent prints.

This presentation will impact the forensic community and/or humanity by providing insight into the effects of different atmospheric and environmental conditions on latent prints as they are exposed to varying environments over a specified time. This scientifically gained information can then be referenced in court proceedings when latent print examiners are called to testify about the longevity of latent prints.

As latent fingerprints are deposited on a surface, several factors may affect their recovery particularly as they age. Such factors include subject, substrate and matrix, and environmental factors. "Subject" factors include age, sex, stimuli, occupation, and medical conditions. For example, a car mechanic with motor grease on his hands would leave a greasy latent print that would resist degradation better than a print made up of mostly sweat, as left by a person who has been exercising. In general, latent prints are composed of 99% water and 1% oil secretions.

Some factors can be accounted for by the latent print examiner but other influences affecting the deposited print are unknown. The examiner does not generally know subject factors, such as age and medical conditions, which may influence the hardiness of the deposited print. "Substrate" factors are associated with the distortion or interference created by the surface on which a print is deposited. This is demonstrated by textured surfaces' inability to retain a good impression as opposed to a smooth surface, which would retain a good latent print. Matrix factors are those involving the material making up the friction ridge skin impression and can be deduced and assessed to some point from the submitted evidence. An example of a matrix is the motor grease in the previous example.

While potentially important, examiners rarely receive information associated with atmospheric and environmental factors that may impact the latent print at the crime scene or on the evidence as it ages. These variables include temperature extremes, humidity, and significant weather events such as rain that may have influenced the permanence of the latent print. All of these variables can interact with the water and oil content of the latent print. This interaction will thereby affect how well the print is preserved and how quickly it will degrade before it is rendered completely useless for comparison purposes.

The effect of atmospheric and environmental factors on the permanence of latent fingerprints is an often-raised question that latent print examiners must face as they testify in court proceedings. Up to this point, examiners have relied on personal knowledge to convey to the court their opinion with respect to the longevity of fingerprints. This experience is not based on peer-reviewed scientific research but rather on the experience of the examiner. In fact, when a literature search is conducted of current journal articles, few studies are identified which document the effects of different environmental and atmospheric factors on a variety of substrates and matrices or on the life of a latent print left on such surfaces.

This study shows the effects of an indoor versus outdoor environment on latent prints over the course of four weeks. Latent prints were deposited on a variety of porous and nonporous surfaces and then placed either inside the building or outside, in a sheltered location. Four types of prints were left on each surface and then collected once a week for four weeks. The four types of prints were clean, natural oils, artificial oils, and dirty prints. The results of this experiment show a pattern of marginal latent print longevity on porous surfaces exposed to summer heat and humidity. Prints on nonporous surfaces also exhibited decreased longevity when exposed to outdoor conditions. The permanence of latent prints decreases as a result of the time spent outdoors. This is in opposition to the same surfaces kept in an indoor environment at a constant temperature and humidity, which exhibit greater permanence in regard to the latent prints, regardless of time spent indoors.

This poster will present the work conducted at the West Virginia State Police Forensic Laboratory-Latent Print section during a summer internship. This internship is to fulfill the requirements of the Marshall University Forensic Science Program Summer Internship.

Latent Prints, Longevity, Environmental Conditions

 ** Presenting Author*