D69 Recovery of Latent Fingerprints After Immersion in Various Aquatic Conditions

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After attending this presentation, attendees will understand the factors that affect latent fingerprint evidence submerged in a freshwater stream and the differences in latent print quality that can be recovered from various aquatic conditions.

This presentation will impact the forensic science community by providing results from an experiment that took place in a natural setting. There is limited published research on the topic of submerged evidence, and even fewer of these experiments utilize a natural aquatic environment. This presentation will add to the research being carried out in the field of underwater crime scene investigation and evidence preservation by broadening the understanding of how latent fingerprints submerged in water are affected by aquatic conditions such as current velocity, sediment types, and macrophyte interaction (i.e., plants, algae, and aquatic life). In addition, it will provide documented results of the deterioration of latent fingerprint evidence as the amount of time submerged in water increases.

As the use of waterways continues to increase for recreational purposes, so do the incidents of criminals using waterways to dispose of evidence.[1] Although some may believe that items recovered underwater will have no forensic value, this research shows that identifiable fingerprints may still be recovered. An experiment was conducted to establish the value of latent fingerprint evidence that had been submerged in a natural aquatic environment. The two factors analyzed in this study that affect the deterioration rate of latent fingerprints were stream current and length of time submerged. To evaluate these factors, latent fingerprints were deposited on metallic objects simulating the substrate of a knife or gun and submerged in a freshwater stream at locations subject to various powers of current for 24, 48, and 72 hours. After recovery, the items were subjected to cyanoacrylate fuming followed by black powder processing; the prints were lifted with tape and examined. Each print was evaluated for its individualizing power based on a scoring system. Latent fingerprints subjected to higher current velocity were significantly more deteriorated than prints subjected to little to no current. A decrease in latent fingerprint visualization with longer periods of submersion was also observed.

It is known that the quality of latent fingerprints naturally deteriorate over time and this study supports this conclusion.[2-5] However, descriptions of the deterioration of friction ridge impressions on a metallic substrate submerged in a natural aquatic environment have not been well-documented and an evaluation of the environmental factors has not been thoroughly investigated. Whereas previous studies reported the successful recovery of good to very good quality latent fingerprints after seven days of submergence, this study has shown that after only three days in a natural aquatic environment, friction ridge impressions on a non-porous stainless steel surface were almost completely obliterated.[6] This illustrates the significance of the factors at play in nature. Studies conducted in an aquarium using only tap water, no current, and no macrophyte, or sediment interaction, are likely to produce deceptive results in comparison to studies conducted in a more natural environment.

In conclusion, the results of this study demonstrate the importance of understanding the interactions between latent fingerprints and the various factors of the natural aquatic environment to better aid in criminal investigations and potentially linking evidence to a perpetrator.

References:

1. Becker, R. F. (2006). *Underwater Forensic Investigation*. Upper Saddle River, N.J: Pearson Prentice Hall.
2. Archer, N. E., Charles, Y., Elliott, J. A., & Jickells, S. (2005). Changes in the lipid composition of latent fingerprint residue with time after deposition on a surface. *Forensic Science International*, *154*(2-3), 224-239.
3. Baniuk, K. (1990). Determination of age of fingerprints. *Forensic Science International*, *46*(1-2), 133-137.
4. Midkiff, C. R. (1993). Lifetime of a latent print: How long? Can you tell? *Journal of Forensic Identification*, *43*(4), 386.
5. Yuille, M. J. (2009). Deterioration of friction ridge impressions on a metallic substrate after submergence in lake water. *Identification Canada*, 48-62.
6. Soltyszewski, I., Moszczynski, J., Pepinski, W., Jastrzebowska, S., Makulec, W., & Janica, J. (2007). Fingerprint detection and DNA typing on objects recovered from water. *Journal of Forensic Identification*, *57*(5), 681-687.

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