



B50 The Collection of DNA From Fingerprints on Weathered Trash Bags

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After attending this presentation, attendees will recognize the importance of the cyanoacrylate fuming technique for the development of fingerprints left on garbage bags after being subjected to weathered conditions. Attendees will also understand the importance of obtaining touch DNA from the developed fingerprints.

This presentation will impact the forensic science community by demonstrating that touch DNA can be obtained from the developed fingerprints on weathered garbage bags.

At crime scenes, any evidence found can be considered probative. Research is being conducted to discover new techniques for the development of fingerprints, the impact of weather conditions on the development of the fingerprint, and/or if the substrate the fingerprint was left on affects the collection. Each of these aspects may affect how fingerprints are collected. Fingerprints are left behind on surfaces by transferring three main products from the secretory glands — sebaceous, eccrine, and apocrine glands — on the human skin. These products include a mixture of organic, inorganic, and environmental contaminants. Every latent fingerprint left behind has different ratios of each component, which can affect the durability, resistivity, and quality of the fingerprint.

The Cyanoacrylate (superglue) Fuming Method (CFM) has been found to be effective for the development of latent fingerprints on non-porous surfaces.¹ This analytical tool involves subjecting a latent fingerprint to cyanoacrylate vapors in an enclosed chamber that polymerizes with the fingerprint residues to form a polycyanoacrylate polymer along the ridges.² Stated in the *Portland Press Herald*, approximately 30% of latent fingerprints collected from crime scenes are usable for fingerprint comparison; this illustrates the importance of being able to collect DNA from the developed fingerprints to analyze and obtain a DNA profile.³ Cyanoacrylate fuming is a non-destructive process, which means DNA transferred from the individual in the latent fingerprint can be extracted and analyzed, which allows for the source of the fingerprint(s) to be determined.⁴

The goal of this research was to collect and develop fingerprints from weathered trash bags through the process of cyanoacrylate fuming, subject each sample to an automated extraction, quantify each sample through quantitative Polymerase Chain Reaction (qPCR), Short Tandem Repeat (STR) profiling, then complete a comparison between the known and unknown samples.

During the research, a series of experiments were conducted to determine if the weather (hot, cold, and light versus dark) affects the quality of latent fingerprints when developed with cyanoacrylate. Each fingerprint was analyzed to determine if a fingerprint comparison could be completed after fuming, then a DNA sample was taken. A control was placed in a room with sunlight and ambient temperature. The effect of sunlight on developed fingerprints was also tested to determine if the quality of the fingerprint changes. This was completed by placing a garbage bag in a dark cabinet that was not opened. Each variable had multiple bags present that contained a total of 20 fingerprints per bag to test if fingerprint quality and DNA analysis is affected by time. A second variable of time was looked at that included leaving the garbage bags outside for a period of 24 hours, 2 weeks, 1 month, and 3 months. After the development of each latent fingerprint, a second method was developed to look at the collection and extraction of DNA from the visible fingerprint. Chosen individuals were given multiple garbage bags and were asked to place their thumbprints on the side of each garbage bag. Each bag was then subjected to a different variable and the fingerprint quality and DNA analysis was tracked and analyzed. For consistency between the amounts of touch DNA, a protocol was determined, which included the time since washing of their hands and the objects each person touched before placement. The focus of future research is the development of a method to test whether the cyanoacrylate fuming technique can develop latent fingerprints on garbage bags, more specifically on the side of garbage bags.

Reference(s):

1. Wargacki, S.P., L.A. Lewis, and M.D. Dadmun. Enhancing the quality of aged latent fingerprints developed by superglue fuming: loss and replenishment of initiator. *Journal of Forensic Sciences*, 2008. 53(5): p. 1138-1144.
2. Wargacki, S.P., L.A. Lewis, and M.D. Dadmun, Understanding the chemistry of the development of latent fingerprints by superglue fuming. *Journal of Forensic Sciences*, 2007. 52(5): p. 1057-1062.
3. Writer, D. H. (2012, June 12). In DNA era, police print lab still crime-solving workhorse. *Portland Press Herald*. Retrieved July 24, 2017, from http://www.pressherald.com/2012/06/12/lab-helps-link-prints-to-crimes_2012-06-12/.
4. Zamir, A., Y. Cohen, and M. Azoury, DNA profiling from heroin street dose packages. *Journal of Forensic Sciences*, 2007. 52(2): p. 389-392.

Cyanoacrylate Fuming, DNA, Fingerprints