E95 Novel Bioaffinity-Based Cascades for the Determination of Biological Sex From Fingerprints

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After attending this presentation, attendees will recognize a new bioaffinity-based method for fingerprint analysis and that fingerprint samples can be used for more than pictorial comparison. These cascade-based assays can be applied in multiple areas so other researchers could apply this methodology to their own research.

This presentation will impact the forensic science community by establishing that fingerprints can be used as a biological sample, similar to blood and sweat. This presentation will also introduce a more rapid method of fingerprint analysis that can one day be applicable for on-site usage. This new method will also encourage other researchers to put more effort into creating techniques that can be used by personnel without scientific training.

In the past century, fingerprinting became a universally accepted and reliable method for identification; however, fingerprint analysis still consists only of pictorial/visual comparisons and ignores the importance of sweat/sebum residue left with the latent prints. There has been no effort to overcome the discipline's dependence on the existence of a prerecorded matching fingerprint for comparison. Due to this limitation, an information-rich latent print may not be used to its full potential or may even be deemed unusable. A bioaffinity-based cascade for the determination of biological sexes from the chemical composition of the sweat/sebum left as the latent prints has been developed.

The research presented addresses the current limitations in fingerprint analysis by using a bioassay system that focuses on the components of fingerprints. Bioaffinity-based assays were developed for the determination of biological sexes from those components. In one assay, L-amino acid oxidase was used to target the amino acids present in the sebum and sweat left on latent fingerprints. A statistical analysis was first performed on 50 mimicked samples to determine the feasibility of this method. Further analysis was then performed on real fingerprint samples collected from volunteers. The contents of those fingerprint samples were extracted from the fatty content of the fingerprint using a newly developed method for subsequent analysis. The assay proved a viable method for differentiating between male and female fingerprints.

Further research led to the testing of authentic fingerprint samples collected from various surfaces as well as the development of other bioaffinity-based assays capable of differentiating between biological sexes via less complex systems. Other bioaffinity-based assays will also be developed in the future for the determination of other physical attributes, such as age group and ethnicity. While these assays will not be able to clearly identify a person of interest, they will be useful for quickly narrowing suspect pools when identification is not possible. The assays will also be useful in cases in which there is not enough time for the process of identification (possibly via DNA) to be completed. The assays that were developed and are currently in development have the potential to become a portable method that can be used for on-site analysis. Also, due to how easily the assay can be performed and interpreted, specialized training for the execution of the analysis is unnecessary, unlike most currently available techniques. These assays could become a very powerful tool for forensics.

Bioaffinity, Fingerprint, Cascade