E55 Fingerprint Analysis: Determination of Biological Sex Via Enzymatic Assay

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After attending this presentation, attendees will understand 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 like blood and sweat. It will also introduce a more rapid method of fingerprint analysis that can one day be applicable for on-site usage. The new method presented here will also spur other researchers to place more efforts on creating techniques usable by personnel without scientific training.

Fingerprint analysis traditionally refers to the process of comparing fingerprint patterns by an expert and/or an automated fingerprint identification system. Currently, the analysis ends with this matching methodology, causing the field to be dependent on the presence of a stored matching print or a matching print from an individual that is physically present. Due to this limitation, a latent fingerprint may be judged to be too smudged or smeared to be of use. What is often overlooked is that those latent prints are created by sweat and sebum emulsions excreted by the fingertips. Those emulsions have their own unique chemical compositions for each individual, making them possible biological samples for analysis. The University at Albany's lab has developed a bioaffinity-based cascade for the determination of biological sexes from the chemical composition of the sweat/sebum left as the latent prints.

The research presented here addresses the current limitations in fingerprint analysis using a bioassay system that focuses on the components of fingerprints. Bioaffinity-based assays have been 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. Further research has 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 extremely 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 have been 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 the ease with which 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.

Fingerprint Analysis, Enzymes, Bioaffinity