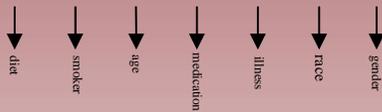


Fingerprint Deposition

Introduction

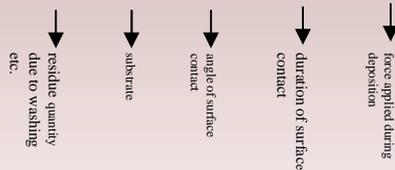
There are many factors that influence latent fingerprint deposition. As a result of these factors it is extremely unlikely that the chemical and physical composition of two fingerprints will be identical. This has produced problems with fingerprint research concerning the repeatability of experiments and the reliability of any conclusions made. For example, differences in fingerprint quality may be due to differences in the pressure of application when the fingerprint was deposited. The aim of this research is to investigate the potential for controlling factors that may influence latent fingerprint deposition.

Factors associated with the donor (chemical composition)



This list represents those factors deemed to be the most significant and influential regarding the chemical composition of latent fingerprint deposits.

Factors associated with fingerprint deposition (physical)



There may be additional factors introduced, relative to specific research projects, for example induced sweating and storage. These can be controlled accordingly.

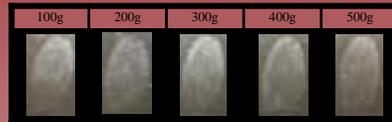
1. Effect of washing on latent fingerprint deposition



All fingerprints have been developed using cyanoacrylate fuming.

The quality of the latent fingerprint, and therefore the developed fingerprint, is improved with unwashed hands due to the increased presence of reactive material present in skin surface matter. Washing physically removes skin surface matter and therefore any reactive material present.

2. Force applied during deposition

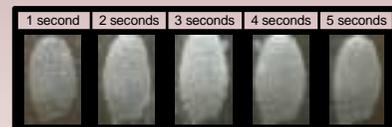


Weights were used to replicate applied force. 1 Newton = 100g
All fingerprints have been developed using cyanoacrylate fuming



True contact with a surface occurs over only a small fraction of the apparent ridge area. Skin surface matter on unwashed hands fills the space between the ridge and substrate resulting in a large area of apparent contact. The lack of skin surface matter on unwashed hands presents a smaller area of apparent contact. As the pressure used for deposition increases, the area of apparent contact with the substrate also increases. A weight of between 300-400g appears to provide adequate pressure for a complete latent print of sufficient quality.

3. Duration of surface contact



Latent fingerprints deposited from the same finger with varying degrees of time in contact with the surface, developed using aluminium powder

Instant retractions of the finger from the substrate leads to the deposition of poor latent fingerprints due to insufficient transfer of skin surface matter. An increase in the duration of surface contact between the finger and the substrate to 2 seconds suitably transfers sufficient skin surface matter onto the substrate for a clearly deposited latent print. Excessive durations of substrate contact transfers an excess of skin surface matter which may lead to 'bleeding' of the skin surface matter from the ridges into the furrows.

4. The angle of deposition

It is difficult to ensure that the same area of contact between the finger and the substrate is made each time a latent print is deposited. This variation makes comparative studies between latent prints of the same finger difficult



Latent fingerprints deposited using the same finger at a variety of different angles, developed using aluminium powder

The Latent Fingerprint Sampler – a solution

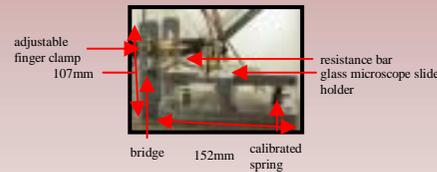
Solution

There is a requirement to control factors associated with latent fingerprint deposition.

Factors associated with the donor		Factors associated with fingerprint deposition	
Variable	Potential to control	Variable	Potential to control
Age	X	Pressure applied	✓
Gender	X	Angle of contact	✓
Race	X	Duration of contact	✓
Diet	X	Substrate	✓
Medication	X	Washing	✓
Illness	X		
Smoker/non smoker	X		

The latent fingerprint sampler provides a means of controlling some of the physical factors associated with latent fingerprint deposition

The Latent Fingerprint Sampler



Method

1. Insert finger into the device by resting the phalanx on top of the bridge, ensuring that the tip of the finger is resting against the resistance bar (select appropriate bar).



2. Secure the finger using the clamp so that the finger cannot be easily moved but ensure that the subject is comfortable. This will control the angle of latent fingerprint deposition.

3. Insert a clean glass slide into holder.

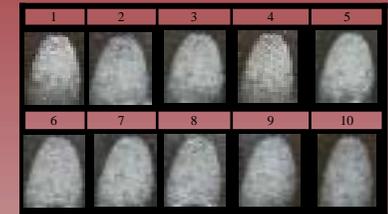
4. The operator should depress the spring to a deflection of 5mm (pre set). This will ensure that a force of 3.03N is applied (3.03N = 303g).

5. Control the duration of contact by maintaining a constant depression for the time period required and then release.

6. Remove slide and repeat stages 3-5 if multiple copies are required.

Inked fingerprints can be taken in the same manner as latent fingerprints. This is useful if a comparison between the latent print and the inked print is required as the same area of the print will be present. This is important in aging studies if the latent print has deteriorated and the examiner wants to estimate the level of degradation.

Results



Latent fingerprints deposited using the latent fingerprint sampler. A depletion series of 10 latent prints was taken and developed using cyanoacrylate fuming.

Examination of the developed fingerprints suggests that each latent fingerprint has been deposited in the same physical manner. This is because the same area of contact has been made with each depletion, demonstrating control of the angle of fingerprint deposition. The force applied and the duration of contact has been controlled by the operator.

Limitations of the latent fingerprint recorder

The device has been designed to only accept glass slides at present and is therefore not able to assist in the deposition of latent prints onto alternative surfaces unless they are of similar size and shape. However, this device has been designed for a research purpose, and in the future there is the potential to adapt the device for alternative surfaces.

The finger tips may enlarge or retract on daily or even hourly intervals according to the individual. As a result different resistance bars may be required on different deposition dates. This may mildly influence the area of contact. However, on any one deposition session each print will have been taken under similar conditions.

The device has been designed to accept fingertips only. However, there is the potential to develop the device to regulate palm print deposition.

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