

## Fingerprint Recovery from Human Skin by Finger Powder

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### Abstract

An examination experiment has been carried out to investigate whether fingerprint powder and lifting technique can recover and transfer latent fingerprints from human skin surfaces of dead bodies. For recovery Swedish Black powder and for transfer White Fingerprint Gelatine were used.

Donors placed fingerprints on the human skin surfaces. Finger marks were then in all cases recovered with Swedish Black powder. The procedure was repeated after 2, 3, 4 and 5 hours. Treated finger marks were secured and preserved as latent fingerprint evidence by lifting process. We recovered 8% finger marks suitable for further examination of all deposited samples on the human skin surfaces.

**Keywords:** Latent Fingerprints; Recovery; Human Skin; Swedish Black Powder

### Introduction

Crime scene investigation is a process that aims at recording the scene as it is first encountered, and recognizing and collecting all physical evidence potentially relevant to the solution of the case. Crime scene investigators who have received comprehensive forensic training usually quickly take over the work at the scene and implement ideas from research institutes in practice. The personnel processing crime scenes should be aware of equipment necessary to process a crime scene and a mechanism to secure and transport the evidence to the laboratory. Physical evidence has the potential to play a critical role in the overall investigation and resolution of a suspected criminal act. We can therefore say that in investigating crimes, we are using traditional investigative approaches with modern methods and “state of the art” tools.

The examination of latent fingerprints involves several steps, progressing from simple to increasingly sophisticated. Most fingerprints are hidden until revealed by chemicals (powder, liquids or gases). Once a print has been revealed, it is usually study or “lifted” and transferred to a laboratory. Scientists have developed more than 40 methods of retrieving fingerprints from crime scenes [1]. In our article we will focus on a method of fingerprint recovery from human skin by finger powder.

At the crime scene the finger marks may be found on many surfaces, including glasses, woods, papers, metals, fruits, vegetables and human skin. According to forensic literature human skin is one of the least convenient surfaces for recovering ridge skin impressions [2]. Hebrard and Donche [3] achieved positive results of finger mark recovery from human skin. They were using several methods include RTX method [4], powders [5-7], iodine fumes [6,7] and CA fuming [8]. The detection was done on surfaces of 16 living persons and 23 dead bodies. Delmas [9] presented the use of luminous magnetic powder. In his study intentionally deposited fingerprints on the skin of five victims were examined. Mashiko and Miyamoto [4] also achieved positive results of finger mark recovery from human skin.

This article is part of a study on fingerprints deposited onto human skin of dead bodies. It contains findings and results of recovery by fingerprint powder and gelatine lifter for finger marks on these surfaces.

### Materials and Methods

In this study Swedish Black powder for recovery of finger marks from human skin was used. Fingerprints were intentionally deposited on the skin surfaces of 10 dead bodies. At first, the dead body was described. Those records contained the circumstances of death, handling of the body, the time that passed from death to research, the body temperature, data about the cleaning the body and the autopsy, if any. The room temperature and relative humidity were measured too. Then a light source was used to visually

scan for finger marks on the surfaces prior of fingerprint deposition. No traces were detected. The site was labelled with an ordinal number with ruler. Fingerprints were deposited on the wrist area, neck area, straight and smooth skin surfaces of the dead bodies without hairy areas, heavily wrinkled and damaged parts of the body. During deposition of finger marks the contact time was between 3 and 5 s. Finger marks were then processed by means of Swedish Black powder. The latents were photographed and then lifted by White Fingerprint Gelatine. All of these tests were held at the department of pathology.

Photos and lifters of finger marks were examined in the forensic science laboratory.

All procedures were recorded by a Canon EOS camera and the fingermarks were examined by fingerprint experts using Adobe Photoshop 7.0 CE.

### Fingerprints on skin surface of dead bodies

Fingerprints were deposited by two separate volunteers onto ten dead bodies - 6 men and 4 women, aged 38 to 91 years. 7 bodies were previously refrigerated in the cold room of pathology department where the room temperature is between 5 and 7 °C. The air temperature in the pathology department and in the forensic laboratory was between 17 °C and 20 °C and the relative humidity level was around 60%.

### Visual examination

This examination was used before any other recovery procedure. A crime scene forensic light source was used.

### Lifting method

The lifting method used for the recovery of fingerprints from dead bodies was White Fingerprint Gelatine. Each of lifters was placed on the mark for at least 3 s. The White Fingerprint Gelatine is composed of a thick, non-aggressive and low-adhesive gelatine layer which makes it possible to lift finger marks, a carrier of linen rubber and a transparent polyester film used for protection. The white linen rubber backing is suitable for writing notes like date, case number, place of crime, etc.

### Powder/brush

Swedish Black powder (100/250 ml) was used for detection as a physical method. The powder was applied to the examined area with a round fingerprint brush with squirrel hair.

### Finger mark examinations

Samples with developed finger marks were examined with a graphics program Adobe Photoshop 7.0 CE. Each recovered and secured (lifted) finger mark was graded into two groups as follows:

- finger mark suitable for further examination (an entire or a partial profile of friction ridge and at least 8 individual features can be observed) and
- finger mark of no use (less than 7 individual features can be observed).

All solvents, powder and lifter were purchased from the BVDA company (Bureau voor Dactyloscopische Artikelen).

## Results and discussion

The worksheets with tables for data entry and results of the investigations were used. Which part of the human skin surface was examined depended on the age, sex, body hair, and deformation of the skin of the dead body. We looked for the smooth and taut skin. Important were the skin surfaces that are most exposed to actions in cases of criminal offences, for example ankle, wrist, neck, chest and leg.

We investigated finger marks on the skin surfaces of human skin of 10 bodies. All together 150 fingerprints has been deposited on different parts of the bodies.

In our study 12 finger marks suitable for further examination were recovered, which is 8% of the performance. Some of them are on Figure 1.

### Finger marks recovered within one hour

By means of Swedish Black 6 samples of finger marks were usable for further examination. Finger marks were recovered on the chest, ulna, femur, shin (2 marks) and area of ankle.

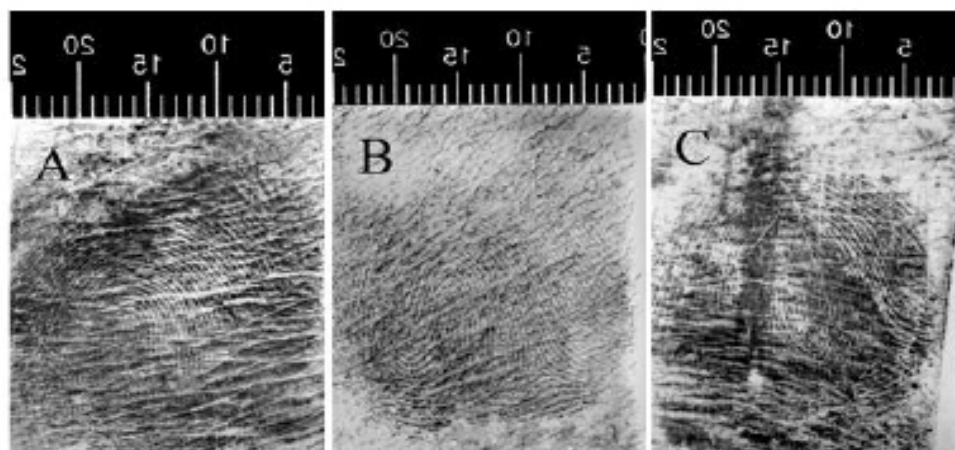
### Finger marks recovered between one and two hours

Two samples of finger marks were usable for further examination. Finger marks were recovered on the chest and ulna.

### Finger marks recovered between two and three hours

Four samples of finger marks were usable for further examination. Finger marks were recovered on the ankle.

Between three and five hours no finger marks were recovered.



**Figure 1:** A. Finger mark from femur surface, recovered by Swedish powder and lifted by Fingerprint Gelatine after fingerprint deposition White  
 B. Finger mark from ankle surface, recovered by Swedish powder and lifted by Fingerprint Gelatine one hour after fingerprint deposition White  
 C. Finger mark from ankle surface, recovered by Swedish powder and lifted by Fingerprint Gelatine two hours after fingerprint deposition White

The most useful finger marks (6 finger marks or 4%) were recovered in the first hour after the time when the fingerprints were deposited on the human skin surfaces. The results in the second hour were less successful, only 2 finger marks (1.3%) were recovered. Between two and three hours 4 finger marks (2.7%) were recovered. In the follow-up examination no latents were detected. Negative results were probably the cause of the body condense. The bodies started heating up or cooling due to the temperature of the laboratory. On the human skin surfaces humidity was detected. It is clear that the fingerprint powder is not method for recovery of wet fingerprint latents. In such cases other chemical methods are recommended [2,3,4,7]. The least suitable surfaces were face, neck, shoulder, humerus, abdomen and wrist. The best results were on the ankles. In this study the temperature of human skin surface was the main reason for negative results. The temperature of skin was between 17 °C and 37 °C. In our circumstances the good condition for the recovery of latent fingerprints on human skin should be approximately equal body and laboratory temperature.

## Conclusions

Powder dusting is the basic and least complicated method for the recovery of fingerprints from many surfaces, from human skin as well. In this study Swedish Black powder was used for the recovery of finger marks and White Fingerprint Gelatine was used for lifting. This study has shown that the best results were achieved for finger marks recovered within one and three hours after fingerprints were deposited onto human skin surfaces. Useful finger marks were recovered from chest, ulna, femur, shin and area of ankle.

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