WHICH WAS FIRST - FINGERPRINT OR BLOOD?

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BACKGROUND

When asked whether a fingerprint in blood was from a bloody finger or from a fingerprint already on the surface that was developed by the blood, there was not literature to support an answer. There are almost no documented experiments or references regarding this subject.

The only reference we found regarding blood on prints was by Jon Creighton[1]. He had dripped blood and allowed it to flow over fingerprints. He also splashed it on the prints. In his experiments the blood was "repelled" by the fingerprint and no development occurred.

In the current instance a light swipe of bloodstained cloth across the fingerprints was of primary interest. Several experiments were designed to determine if such a light swipe could develop fingerprints.

PURPOSE

The questions to determine the answers to were:

- Is there a difference in previously deposited palmar (eccrine gland) sweat prints and sebaceous oil prints as to the manner blood deposits on them?
- Is it possible to develop previously (24hours) deposited prints using a swipe of a bloody cloth?
- Can it be determined if the blood was on the finger or a clean finger touched a small amount of blood on the surface?
- Can we tell if a wet bloody finger has touched a dry surface?
- What characteristics are exhibited which can be used to determine how the prints was made?

EXPERIMENTAL DESIGN

1. Several glass sheets, soda cans, and a large painted metal sheet were cleaned to ensure that there were no fingerprints or greases present. The following substances were used to coat the fingers the fingerprints were deposited on the various surfaces.

    a. Anti-Perspirant*
    b. Butter
    c. Corn chip oil
    d. French fries **
    e. Motor Oil
    f. Silicon oil
    g. Gum turpentine
    h. Hamburger fat**
    i. Hand lotion ***
    j. Grease from car
    k. Sebaceous prints
    l. Eccrine prints

* Arrid extra dry

** McDonald's "Big Mac & Fries"

*** Vaseline Aloe & Lanolin

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[1] Creighton, Jon T., *Visualization of Latent Impressions After Incidental or Direct Contact with Human Blood*, Journal of Forensic Identification, 47 (5) 1997 pp534-541

The prints were allowed to dry overnight at room temperature (74°F) prior to adding blood. Beef blood[1] was soaked onto a large swab, which was pulled to create a "tail". The end of the swab was dragged over the prints.

2. A single blood drop was deposited onto a dry surface then touched and a single drop was placed on a finger and applied to the same surface.

3. Fingerprints were deposited on the painted metal sheet using a finger wet with blood in varied amounts.

RESULTS

The blood over the prints on paper in grease, oil, and excretions did not show up as the material had absorbed into the paper. However, the print in the hand lotion did show ridge detail when coated with blood.

As expected, eccrine prints are not revealed with blood as reportedly there are no organic solids in eccrine prints[2]. The sebaceous prints are visualized with the blood.

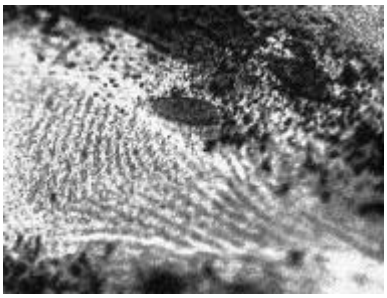

Figure 1. Eccrine print

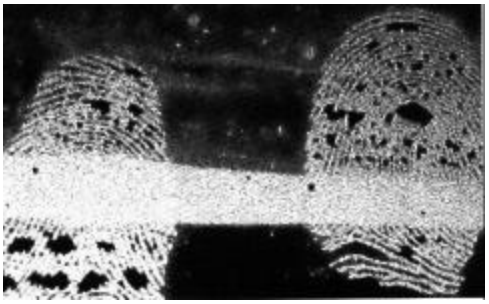

Figure 2. Sebaceous print.

The eccrine print is revealed by reflected light. It was not visualized by blood as the sebaceous print was.

The prints on the non-porous surfaces showed ridge detail. The blood does not adhere to the organic solids but runs in the channels between the ridges. The appearance of the prints is sharp and well defined with some blood spots where it "pooled" (figure 3). These prints can be easily distinguished from prints into a blood smear. Touching a blood smear leaves a "halo" around the print and the print is not as "clean" as the organic solid prints (figure 4).

Figure 3. Grease print revealed by blood swiped over surface.

Figure 4. Dry fingers into a blood smear

[1] Beef blood was used to conduct the experiments. Beef blood from the butch shop is from disease free cattle and can be disposed of by throwing it into the trash as it is a food products not a biohazardous material. The physical properties of beef blood are essentially the same as human (See Raymond it al, The Physical Properties of Blood-Forensic Considerations, Science & Justice, 36, 3, (1996) pp 153-160)

[2] Home Office, *Scene of Crime Handbook of Fingerprint Development Techniques* Heanor Grate, Derbyshire, 1988 p 10

Experiments designed to reproduce the results obtained by Jon Creighton by allowing blood to run over grease prints. It was found that dripping blood down a non-porous surface would not stick to the surface where there is a grease print. The blood will skip over the print. This suggests that when looking at a surface with blood trails, these "skips" should be noted as locations to dust for fingerprints.

A finger was coated with blood and fingerprints were lef5t on dry surfaces. The resultant print is a patent print (figure 5). The quantity of blood on the finger will determine whether or not the print is "reversed".

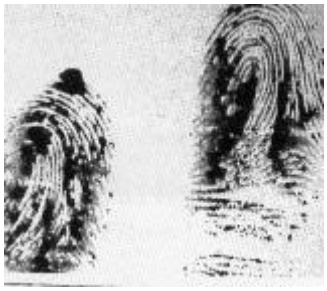

Figure 5.

A fingerprint left on a dry surface from blood on the finger.

This appears the same as an "inked" fingerprint.

A small drop of blood was placed on a non-porous surface and a porous surface. A finger was pressed onto the blood. Then the same size drop was placed on the finger and the surfaces were touched with the same pressure. No difference was detected in the resultant patterns, which show blood going to the side of the print with trails or ridge buildups.

To determine how much pressure it would take to obliterate the prints some of the grease prints were redeposited. A weighted, blood-soaked swab was dragged over the surface. We found that approximately 120 grams (4.3oz.) weight was sufficient to destroy the previously deposited impression.

CONCLUSIONS

These experiments answer the following questions:

1. Will blood visualize previously deposited eccrine prints?

   No. There is not enough organic material present to influence the manner in which the blood wets or adheres to the surface.

2. Can blood smeared across a greasy fingerprint visualize the print?

   Yes. The pattern will be reversed. The previously deposited print is visualized by the blood being repelled into the furrows away from the ridges. In some areas the blood will pool, causing a speckling, so visualization is not even.

3. Is there a difference in a grease print on a horizontal surface and a vertical surface?

   Yes. As the plane of the surface is moved from horizontal, less blood stays in the furrows. At an angle defined by the substance and the surface, all blood will be repelled and no visualization of the fingerprint will occur.

4. Can it be determined if a single drop of blood was on the surface or was on the finger?

   Not always. The finger print pattern produced is the same when the blood is wet and just deposited. If the blood has dried somewhat on the surface, a "ghost" of the blood drop circumference may remain.

5. Can the print left by a bloody finger be distinguished from a light blood smear over a grease print?

   Yes. There is a distinct difference. The bloody finger will leave a clear area or "halo" around the fingerprint resulting from the pressure repelling the liquid.

6. How much pressure destroys the print?

   Approximately 4 ounces or a quarter of a pound is needed to smear the print. Therefore, any more than four ounces of pressure on a grease print at room temperature will smear or destroy the print. If one picks an object up, the amount of force onto the side surfaces is dependent upon the weight and coefficient of friction of the object. If the force exceeds 4 ounces, there will be no remaining prints.

7. Can a fingerprint deposited by a finger with blood on it be distinguished from a fingerprint left in grease or oil and revealed by brushing it with blood?

   Yes. A light smear of blood on the fingers will leave the classical "inkpad" print when applied to a smooth dry surface. The print will not be reversed unless there is a sufficient amount of blood to be forced into the furrows by pressure.

Figure 6.
Print in butter

Figure 7.
Print in motor oil