

Technical Note

Research on Transferring a Fingerprint to a Ninhydrin-Treated Document

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Background

In February 2002, I was a lab technician working in the development of latent fingerprints. At a preliminary hearing of a double homicide, one of the defense lawyers asked me whether it was possible to transfer, with the help of an adhesive lifter or other device, someone's prints onto a document that had been previously treated with ninhydrin. The purpose of his question was to find out whether someone could have transferred his client's fingerprints onto the document evidence that I had previously treated. The question was based on the fact that when one touches a ninhydrin-treated surface, fingerprints will often appear because of the constant state of reaction of the chemical product.

My answer was that, as far as I knew, no study had ever been made on the subject, although I viewed the possibility as practically nil. Not having any research on which to rely, I initiated some laboratory tests.

The History of the Ninhydrin Technique

In 1910, a researcher by the name of Ruhemann [1] produced a substance, triketohydrindene hydrate (ninhydrin), that reacted with amino acids, producing a purplish discoloration. In the 1940s, this product was used in biochemistry to add color to amino acids [4]. People were warned not to touch the samples because of an intense reaction of the product with fingerprint deposits. In 1954, two Swedish biochemists, Oden and Von Hoffsten, suggested the use of ninhydrin for criminal investigations [2]. During the late 1950s and 1960s, the use of ninhydrin was implemented in some laboratories. In 1974, a formula using 1,1,2-trichlorotrifluoroethane as an improved carrier was introduced by Morris and Goode [3]. Ninhydrin is now used worldwide by police departments to enhance fingerprints.

Materials and Methods

We selected two different surfaces on which to deposit fingerprints: a plastic ziplock bag and a stainless steel table. The plastic ziplock bag was selected because it is easy to handle, its surface is nonabsorbent, and it could be pressed directly against the paper. The stainless steel table was selected because the lifter would be able to grab all the deposition without damaging the surface. The sticky side of the lifter was then put onto the paper and was gently removed, without tearing the paper. For the ninhydrin-treated tests, the ninhydrin was applied with a sprayer. The mixture we used (ninhydrin 0.5%; 30 ml of ninhydrin in 1000 ml of 1,1,2-trichlorotrifluoroethane) has been used by our agency as the standard solution for many years.

Parallel to the tests that were done, two samples without any fingerprints (controls 1a, 2a) and two samples with fingerprints (controls 1b, 2b) were treated using the same procedures as were used on the other samples. These tests were also repeated, using a second donor.

Samples	Description of fingerprint process prior to transfer	Ninhydrin-Treated Papers	
		Paper completely dried	Paper still moist
1 A	A fingerprint that has not been dusted; transferred with a lifter from a stainless steel table.	x	
1 A.1	A fingerprint that has not been dusted; transferred with a lifter from a stainless steel table.		x
1 B	A fingerprint that has been dusted with white powder; transferred with a lifter from a stainless steel table.	x	
1 B.1	A fingerprint that has been dusted with white powder; transferred with a lifter from a stainless steel table.		x
1 C	A fingerprint that has not been dusted; transferred from a ziplock bag.	x	
1 C.1	A fingerprint that has not been dusted; transferred from a ziplock bag.		x
1 D	A fingerprint dusted with white powder; transferred from a ziplock bag.	x	
1 D.1	A fingerprint dusted with white powder; transferred from a ziplock bag.		x
1 E	A fingerprint taken with a lifter directly from the finger and transferred.	x	
1 E.1	A fingerprint taken with a lifter directly from the finger and transferred.		x
Control 1 a	No fingerprint deposit on paper (blank).	x	
Control 1 b	Fingerprint placed directly with the finger.		x

Test 1

Samples	Description of fingerprint process prior to transfer	Untreated paper ¹	Moistened Paper ²
2A	A fingerprint that has not been dusted; transferred with a lifter from a stainless steel table.	x	
2A.1	A fingerprint that has not been dusted; transferred with a lifter from a stainless steel table.		x
2B	A fingerprint that has been dusted with white powder; transferred with a lifter from a stainless steel table.	x	
2B.1	A fingerprint that has been dusted with white powder; transferred with a lifter from a stainless steel table.		x
2C	A fingerprint that has not been dusted; transferred from a ziplock bag onto dry paper.	x	
2C.1	A fingerprint that has not been dusted; transferred from a ziplock bag onto ninhydrin- moistened paper for a second time.		x
2D	A fingerprint that has been dusted with white powder; transferred from a ziplock bag.	x	
2D.1	A fingerprint that has been dusted with white powder; transferred from a ziplock bag onto ninhydrin-moistened paper for a second time.		x
2 E	A fingerprint taken with a lifter directly from the finger and transferred.	x	
2 F	A fingerprint that has not been dusted; transferred onto a ziplock bag with contact pressure laid upon it for 17 hours.	x	
Control 2 a	No fingerprint placed onto the paper.	x	
Control 2 b	A fingerprint placed directly on paper.	x	

1 Treated with ninhydrin after the transferred print was deposited.

2 The substrate with the fingerprint deposit was pressed against an untreated paper during the application of ninhydrin.

Test 2

Results

Chart 1 : Fingerprints taken in alliance with the method used to transfer the fingerprint onto the sheet of paper.

Samples	Fingerprints developed
1 A	Negative
1 A.1	Negative
1 B	Negative
1 B.1	Negative
1 C	Negative
1 C.1	Negative
1 D	Negative
1 D.1	Negative
1 E	Negative
1 E.1	Negative
Control 1 a	Negative
Control 1 b	Positive
2 A	Negative
2 A.1	Negative
2 B	Negative
2 B.1	Negative
2 C	Negative
2 C.1	Negative
2 D	Negative
2 D.1	Negative
2 E	Negative
2 F	Negative
Control 2 a	Negative
Control 2 b	Positive

Negative = No prints
Positive = Prints

Discussion

Following these experiments, it was observed that a print lifted and transferred onto the untreated paper gave negative results (2A, 2B). The same experiment was performed on paper still wet with ninhydrin, with negative results (samples 2A.1, 2B.1). The same two experiments were done using paper that had been previously treated with ninhydrin, with negative results (samples 1A, 1A.1, 1B, 1B.1).

These experiments have led us to the conclusion that the lifter, with or without powder, is useless when trying to transfer a print to a piece of paper. Another approach was developed to maximize the chances of transferring the print from a lifter. A print taken directly from a finger (a bigger concentration of amino acids, lipids, etc.) was transferred onto paper not treated with ninhydrin, then onto paper previously treated with ninhydrin, with negative results (samples 1E, 1E.1, 2E). The inefficiency of the lifter for the transfer of prints on ninhydrin-treated or untreated paper seems evident. Another question still remained: Can a print be transferred from a smooth surface onto paper?

The transfer of prints (both powdered and nonpowdered) from a smooth surface onto paper before the ninhydrin treatment was attempted. Negative results were found in the research for prints (samples 2C, 2C.1, 2D, 2D.1). A second try was attempted on ninhydrin-treated paper, with negative results (samples 1C, 1C.1, 1D, 1D.1). Finally, the transfer of a nonpowdered print from a smooth surface onto a paper, combined with contact pressure for 17 hours, was attempted, with negative results (sample 2F).

Conclusion

Although it is a well-known fact that one must maintain great vigilance following ninhydrin treatments (i.e., ninhydrin remains active a very long time, and fingerprints placed upon a document after the treatment will eventually show up), it is evident from this study that the secondary transfer of prints (i.e., transferring the print using a lifter or pressing a smooth surface) to ninhydrin-treated paper is very unlikely.

Acknowledgment

The author would like to thank crime investigator C. Bourdua (Police Department of the City of Montreal) and C. Bonneville for helping in the translation of this report into English.

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