Evaluation of Physical Developer for Latent Prints

NCSCL Latent Evidence Section, Summer 2019
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INTRODUCTION

Physical Developer (PD) is used to develop latent prints on **porous items of evidence**, such as paper or cardboard [2]. PD reacts with the lipids and fats in sebaceous sweat left behind in fingerprints. Dependent upon various agencies, there are deviations in the chemical preparation and processing steps of PD [1]. This research into PD will be useful for **determining the optimal conditions and protocol** for developing prints on various porous items.

NCSCL PD PROTOCOL

#1 Pre-Wash
DI Water
Shaker
Time: 10 minutes

#2 Maleic Acid
Maleic Acid Solution
Shaker
Time: 10 minutes

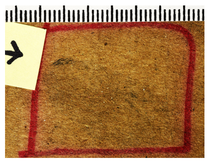
#3 Working Solution
Combined Solution
(Redox, Detergent, Silver Nitrate)
Shaker
Time: 10 minutes

#4 Rinse
Tap Water
No Shaker
Time: 3 minutes

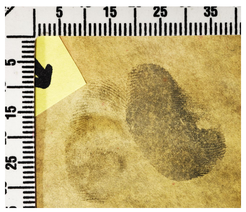
RESULTS

Experiment 1
New [$AgNO_3$]
Sweat Print
28 Days Old

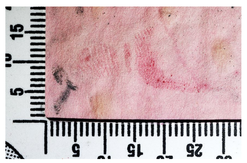
Experiment 2
No Pre-Wash
Sweat Print
29 Days Old



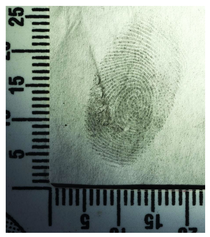
Experiment 3
Crrgtd Cardboard
Sweat Print
34 Days Old



Experiment 4
Shaded, Wet
Sweat Print
42 Days Old



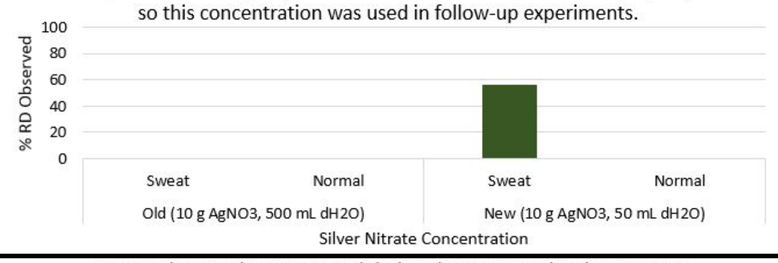
Experiment 5
IND-NIN-ORO-**PD** (Wet)
Sweat Print
50 Days Old



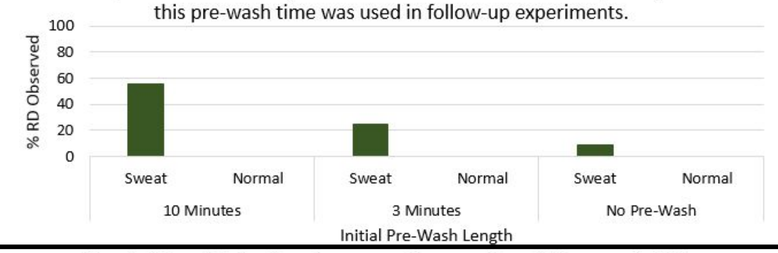
Experiment 5
IND-NIN-**PD** (Wet)
Sweat Print
50 Days Old

DATA ANALYSIS

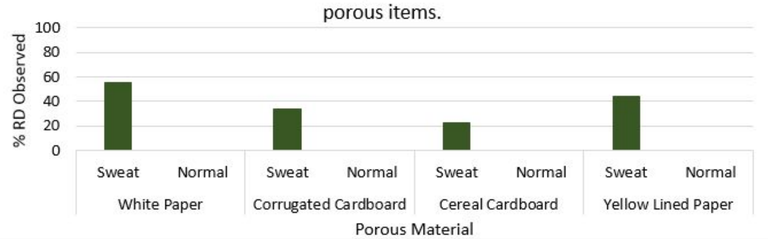
Exp. 1: The new $AgNO_3$ concentration was effective in developing RD, so this concentration was used in follow-up experiments.



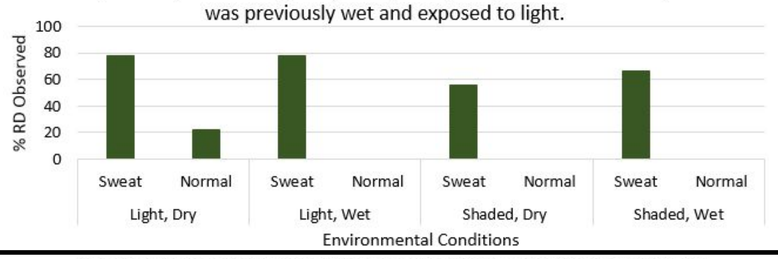
Exp. 2: The 10 minute pre-wash led to the most RD development, so this pre-wash time was used in follow-up experiments.



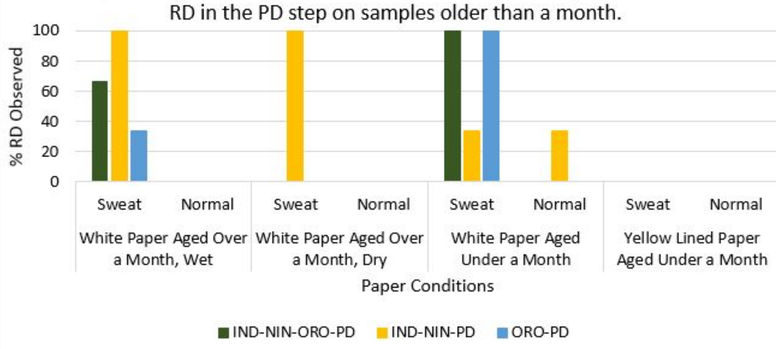
Exp. 3: More RD developed on paper than cardboard. The new $AgNO_3$ concentration and 10 minute pre-wash were successful on other porous items.



Exp. 4: PD produced higher quantity and quality RD when the sample was previously wet and exposed to light.



Exp. 5: Pre-processing with IND-NIN and without ORO produced more RD in the PD step on samples older than a month.



DISCUSSION

To evaluate the NCSCL PD protocol, we purposely laid a set number of sweaty and normal prints on samples exposed to a variety of conditions. We examined **silver nitrate concentration, pre-wash time, porous material, environmental conditions, and chemical preprocessing before the final PD step.** We determined that the protocol should utilize the new silver nitrate concentration and a 10 minute pre-wash to develop the highest percentage of ridge detail (RD). With this amended protocol, RD was developed on both cardboard and paper items. The success of PD was not hindered by environmental conditions. Samples exposed to light developed more RD than shaded ones, and RD was more likely to develop on a sample that had been wetted after the prints were deposited. Chemical preprocessing with Oil Red O (ORO), regardless of the use of indanedione (IND) and ninhydrin (NIN), developed more RD on samples younger than a month.

Based on this research, the only adjustment we suggest to the NCSCL PD protocol is **amending the silver nitrate concentration to 10 g $AgNO_3$ and 50 mL dH_2O.** We conclude that PD is more likely to produce RD from **sweaty prints older than a month** and that PD is more successful on samples that have **previously been wet.**

ACKNOWLEDGEMENTS

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REFERENCES

[1] de Puit, M., Koomen, L., Bouwmeester, M., de Gijt, M., Rodriguez, C., van Wouw, J., & de Haan, F. (2011). Use of physical developer for the visualization of latent fingerprints. *Journal of Forensic Identification, 61*(2), 166-170. Retrieved from https://search-proquest-com.mutex.gmu.edu/docview/858886796?accountid=14541
[2] Physical Developer. (n.d.). Retrieved June 3, 2019, from https://www.cbdiai.org/physical-developer.html

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