# Sensitivity of Preliminary Blood Test on Various Floor Surfaces After Washing with Different Cleansing Products. : Original Work

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**How to cite this article:** Oshin Hathi, Lav Kesharwani, Munish Kumar Mishra. Sensitivity of Preliminary Blood Test on Various Floor Surfaces After Washing with Different Cleansing Products. : Original Work. Indian Journal of Forensic Medicine and Toxicology/Volume 18 No. 1, January-March 2024.

**Abstract**

Blood is important evidence that can assist an investigator in solving a crime. It connects the suspect to a crime and aid in the reconstruction of the crime scene. Criminals frequently attempt to wipe away blood stained evidence at a crime scene. These efforts may result in the modification or partial or total elimination of blood on the stained parts. Numerous presumptive tests are employed to identify bloodstains on floor surfaces since they are frequently cleansed after a crime using various surfactants. However, the traces of stains remain there and if analysed with appropriate reagents will give conclusive results. In This study Blood-stained floor surfaces were cleaned using a commercially available and widely used floor cleaners and After repeated washings, the Kastle-Meyer (KM), Leucomalachite green (LMG), and Tetra methylbenzidine (TMB) tests were employed to determine the presence of blood on these surfaces, and their sensitivity were assessed, this study will help the forensic investigator to select the appropriate reagents for detection of blood stains on the various washed floor surfaces and effectiveness of reagents for detection of blood stains washed with various floor cleaners.

**Keywords:** Blood-Stained floor, Floor Cleaners, presumptive tests, TMB, KM, LMG

## Introduction

The crime rate in India and the rest of the globe is skyrocketing, and there is an urgent need for characterisation and individualization of evidence gathered at crime scenes.

Among the investigations which fall under the purview of forensic science, the recognition of blood stain forms one of the most important problems which needs utmost attention and solution. Blood stains are significant evidence used in many forensic investigations.[1]

Blood is one of the most crucial biological evidence found at the crime scene in almost all assault cases [2] and it needs immediate characterization as it can help reconstruct the crime scene.

Perpetrators of a crime sometimes attempt to remove or destroy evidence that may link them to their crime. It is therefore important for crime scene investigators (CSIs) to understand the effects of certain scene-altering activities on the evidence they are attempting to locate [3] .In few cases where blood is washed off from the crime scene/surface, it

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**Submission Date:** Jul 19, 2023 **Revision Date:** Sep 13, 2023 **Publication date:** Jan 19, 2024

becomes one of the most crucial problems faced in forensic examination of the criminal cases to detect the blood spots. [4]

Locating, investigation and interpreting such blood stains with unaided eyes then becomes a challenging task [4] .The identification of the alleged blood is thus required as the first step. There are a number of preliminary test employed for this purpose such as Tetra methyl benzidine test, Kastle Meyer test, Leucomalachite green test etc.

The present study has been taken up for the selection of the most efficient test for various flooring surfaces that have been washed with suitable floor cleaners.

## Methodology

This study was carried out in the Department of Forensic Science of Sam Higginbottom University of Agriculture, Technology and Sciences.

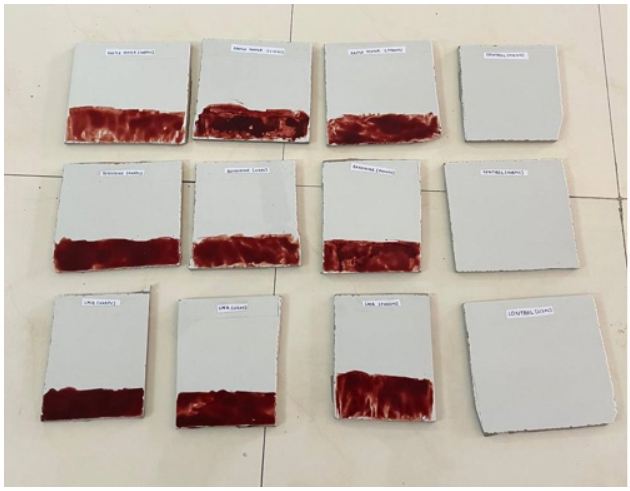
### Sample Collection

Blood samples (discarded) were collected from Central pathology of Swaroop Rani Nehru Hospital Prayagraj and stored in anti-coagulant EDTA vials.

### Surface preparation

All the three flooring surfaces viz. Marbles, Tiles and Concrete were cut in specific dimensions, labelled with all necessary details and stained with blood and left to dry for 24 hours.

The surfaces were washed with Harpic, Lizol and Phenyl until all the blood was completely washed off.



**Figs. 1 Tiles surfaces stained with blood along with control tile samples.**

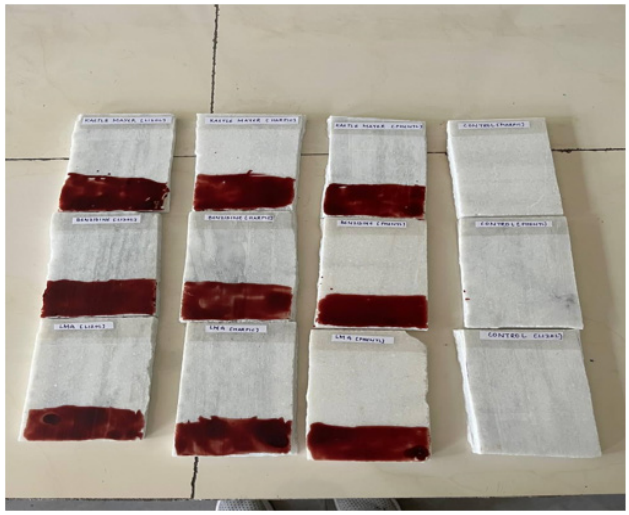


**Fig. 2 Marble surfaces labelled and stained with blood along with the control samples.**

**Fig. 3 Concrete surfaces labelled and stained with blood along with control samples.**

### Examination

A cotton swab dipped in normal saline was swabbed over the surfaces and subjected to preliminary tests for detection of blood.

Similarly surfaces were washed for 5 subsequent washes and swabbed and then tested for preliminary tests.

## Results and Discussion

All the flooring surfaces were washed for subsequent 5 washes and swabbed with normal saline for detection of blood.

**Following observations were drawn:**

**Table 1: Detection of blood on tiles using tetra methyl benzidine test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | + | INC | -- | -- |
| Harpic | ++ | + | INC | -- | -- |
| Lizol | ++ | + | INC | -- | -- |

**Table 2: Detection of blood on tiles using Kastle Mayer test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | + | -- | -- | -- |
| Harpic | ++ | + | -- | -- | -- |
| Lizol | ++ | + | -- | -- | -- |

**Table 3: Detection of blood on tiles using Leuco Malachite Green test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | + | -- | -- | -- |
| Harpic | ++ | + | -- | -- | -- |
| Lizol | ++ | ++ | -- | -- | -- |

**Table 4: Detection of blood on marble using tetra methyl benzidine test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | + | INC | -- | -- |
| Harpic | ++ | + | INC | -- | -- |
| Lizol | ++ | + | INC | -- | -- |

**Table 5: Detection of blood on marbles using Kastle Mayer test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | ++ | + | -- | -- |
| Harpic | ++ | ++ | -- | -- | -- |
| Lizol | ++ | ++ | + | -- | -- |

**Table 6: Detection of blood on marbles using Leuco Malachite green test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | + | -- | -- | -- |
| Harpic | ++ | + | -- | -- | -- |
| Lizol | ++ | ++ | -- | -- | -- |

**Table 7: Detection of blood on concrete using tetra methyl benzidine test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | ++ | + | + | INC |
| Harpic | ++ | ++ | ++ | ++ | ++ |
| Lizol | ++ | ++ | + | + | INC |

**Table 8: Detection of blood on concrete using Kastle Mayer test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | ++ | + | + | + |
| Harpic | ++ | ++ | ++ | ++ | ++ |
| Lizol | ++ | ++ | + | + | + |

**Table 9: Detection of blood on concrete using Leuco malachite green test after washing them with different surfactants.**

| | Wash 1 | Wash 2 | Wash 3 | Wash 4 | Wash 5 |
|---|---|---|---|---|---|
| Phenyl | ++ | ++ | ++ | ++ | ++ |
| Harpic | ++ | ++ | ++ | ++ | ++ |
| Lizol | ++ | ++ | ++ | ++ | ++ |

++ Good
+ Fair
– Negative
INC Inconclusive

## Discussion

The most common biological evidence at the crime scene is bloodstains. For this reason, bloodstain is one of the most important types of evidence in forensic science that can help investigators to solve a crime. It can link a suspect to a crime and also help reconstruct the crime scene. Criminals often tend to clear up and eliminate evidence from the scene[5]. After a criminal act, a perpetrator would try washing bloodstains either by washing in cold water or using a regular washing process. These attempts may cause the bloodstains to change and eventually to be partially or completely removed. In addition, bloodstains can be found on various surfaces at the scene. Due to this reason, floor such as Marble, tiles and concrete, which are mostly encountered at the scene, were chosen in this study.

The author concludes that the forensic serologist should consider the factors that are investigated in this study before rendering an opinion on the bloodstains which are retained on washed floor. In this study, bloodstained floor was washed with commercially available and frequently used Phenyl, harpic and lizol. Kastle-Meyer (KM), Leucomalachite green (LMG) and Tetramethylbenzidine (TMB) tests were used to detect the blood on these washed floors. The most sensitive test, which was found to be to detecting the washed stains on all floor, was Tetramethylbenzidine test. The Kastle Mayer test was found to be the least sensitive. The capacity of a floor to retain the amount of blood after washing depends not only upon the chemistry and upon manufacturing of the floor but also on the type of phenyl, harpic and lizol. The time of immersion of the floor with washing material also affects the removal of stains from[6]. However, (**Cox (1990)**[8] and (**Mushtaq S. *et al.*,**) [7] both stated only about the presumptive test of blood stains after washing. They could not explain the individualization method of washed blood stains and the sensitivity of blood stains after number of washings, which has been explained in this work.

## Conclusion

During the course of this study it was concluded that concrete surfaces retain more blood on its surface than marbles which in turn retained more than tiles.

In this study it was concluded that for the detection of blood on flooring surfaces kastle mayer and leuco malachite green were found to be more sensitive.

According to the conditions of the present study, sensitivity of the preliminary blood tests was concluded as:

**Kastle Meyer >Leuco Malachite Green > Tetra Methyl Benzidine**

**Ethical Clearance:** Not required

**Source of Funding:** Department of Forensic Science

**Conflict of interest:** Nil

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