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A STUDY TO ESTIMATE THE EXTENT OF INEFFICACY OF EXISTING PRESUMPTIVE TESTS ON BLOOD STAINS CONTAMINATED WITH COMMON CONTAMINANTS ENCOUNTERED IN SOUTHERN INDIA

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INTRODUCTION

Blood is the most common evidence in crimes and is many a times crucial in fixing the corpus delicti, proving the modus operandi and also the actus reus during a crime. Presumptive testing of suspected blood stains is the first step in the forensic examination of blood. Presumptive tests are usually performed at the scene of the crime and form the basis on which a stain is collected for further examination in the FSL. The common presumptive tests performed for identification of blood are Benzidine and Kastle Meyer tests.

Even though the efficacy of presumptive tests is highly reliable, in the presence of certain contaminants, their efficacy

is altered. In South India, the common practise of using beautifying skin and hair additives is predominantly observed. This study attempts to identify the extent to which common contaminants, namely turmeric, kumkum, and coconut oil, reduce the efficacy of the presumptive tests (Benzidine and Kastle Meyer tests) for blood.

OBJECTIVE

- To identify if contaminants (turmeric, kumkum, and coconut oil) have a negative impact on the performance of the presumptive tests, Benzidine and Kastle Meyer Tests, used for forensic identification of dried blood stains.
- To identify how many among the three contaminants (turmeric, kumkum, and coconut oil), have a negative impact on the presumptive tests.
- To identify if the negative impact on the presumptive tests is quantifiable.

METHODOLOGY

To analyse the effect of each of the contaminants on the presumptive tests, the entire study was split into three phases:

Phase 1 – Conceptualization

In this phase, attempts were made to test contaminated blood in increasing concentrations of the 3 different contaminants. The threshold concentration at which each contaminant gave a false negative result for each presumptive test was identified in this phase.

Blood was serially diluted up to the 6th dilution, and the specific contaminant was added to each of the 6 dilutions in the following concentrations and tested against Benzi-

dine and Kastle Meyer tests separately.

The results were as follows:

It was decided to discontinue the use of the Kastle Mayer test for turmeric and kumkum contaminants as they gave false positive results even in the absence of blood.
However, in the case of coconut oil, both Benzidine and Kastle Mayer tests were performed.

Concentration	TURMERIC		KUMKUM		COCONUT OIL	
	Benzidine test	Kastle-Meyer test	Benzidine test	Kastle-Meyer test	Benzidine test	Kastle-Meyer test
Blood 0.05 ml% Contaminant – 4g%	Blue green colour	Faint pink colour	Blue green colour	Faint pink colour	Blue Green colour	Faint pink colour
Blood – 0.025 ml% Contaminant – 4g%	No colour change	Faint pink colour	No colour change	Faint pink colour	Blue green colour	Faint pink colour
Blood – 0.0125 ml% Contaminant – 4g%	No colour change	Faint pink colour	No colour change	Faint pink colour	Faint blue green colour	No colour change
Blood – 0.00625 ml% Contaminant – 4g%	No colour change	Faint pink colour	No colour change	Faint pink colour	No colour change	No colour change
Blood – 0.00313 ml% Contaminant – 4g%	No colour change	Faint pink colour	No colour change	Faint pink colour	No colour change	No colour change
Blood – 0.00156 ml% Contaminant – 4g%	No colour change	Faint pink colour	No colour change	Faint pink colour	No colour change	No colour change

Phase 2 – Replication
In this phase, the identified threshold concentration of contamination was prepared, and the presumptive tests were performed 30 times to check the accuracy of the findings.

TURMERIC	KUMKUM	COCONUT OIL	
Benzidine Test (Blood – 0.025 ml% Contaminant – 4g%)	Benzidine Test (Blood – 0.025 ml% Contaminant – 4g%)	Benzidine Test (Blood – 0.00625 ml% Contaminant – 4g%)	Kastle – Mayer Test (Blood – 0.0125 ml% Contaminant – 4g%)
No colour change in all 30 attempts	No colour change in all 30 attempts	No colour change in all 30 attempts	No colour change in all 30 attempts

In all the replicated attempts, the result proved to be the same - negative for blood.

Phase 3 – Validation:

In this phase, the findings were statistically analysed to identify the validity of the identified results.

As the results in all the replicated attempts were found to be false negative, the need for statistical validation was absent.

FINDINGS

- When turmeric was used as a contaminant, it was found that the Benzidine test did not detect the presence of blood in a dilution mixture of Blood – 0.025 ml% + Contaminant – 4g% and above.
- When kumkum was used as a contaminant, it was found that the Benzidine test did not detect the presence of blood in a dilution mixture of Blood – 0.025 ml% + Contaminant – 4g% and above.
- The Kastle Meyer test could not be interpreted as the pink colour was due to interference of turmeric and kumkum (false positive results were noted in the presence of trace amounts of turmeric and kumkum).
- When coconut oil was used as a contaminant, it was found that the Benzidine test did not detect the presence of blood in a dilution mixture of Blood – 0.00625 ml%+

- Contaminant – 4g% and above.
- When kumkum was used as a contaminant, it was found that the Benzidine test did not detect the presence of blood in a dilution mixture of Blood – 0.025 ml% + Contaminant – 4g% and above.
- The Kastle Meyer test could not be interpreted as the pink colour was due to interference of turmeric and kumkum (false positive results were noted in the presence of trace amounts of turmeric and kumkum).
- When coconut oil was used as a contaminant, it was found that the Benzidine test did not detect the presence of blood in a dilution mixture of Blood – 0.00625 ml% + Contaminant – 4ml% and above, and the Kastle Meyer test did not detect the presence of blood in a dilution mixture of Blood – 0.00125 ml% + Contaminant – 4ml% and above.

CONCLUSION

In cases where scientific evidence was heavily relied on, false positive/false negative results can be of major concern. They can lead to a rampant rate of acquittal.

Presumptive tests are relied on by field scientific officers to decide whether the evidence needs to be collected and forwarded to the Forensic Science Laboratories. When these tests provide false positive/false negative results, this can adversely affect the progress of the investigation.

This study addresses the extent to which common contaminants can lead to a false interpretation of the commonly used presumptive tests. This study can be a basis on which a more extensive study can be performed to understand the

impact of these contaminants as well as similar contaminants on presumptive tests at large.

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DID YOU KNOW?

Bugs can help solve a crime. It's actually called forensic entomology. While bugs can't actually solve a crime, investigators are able to look inside of an insect's (typically a maggot) stomach and is able to determine how long a body has been decomposing.