

# MENSTRUAL BLOOD

## PMB TEST



### DETECTION OF MENSTRUAL BLOOD

- + fast, sensitive and reliable presumptive test for menstrual blood
- + human d-dimer as marker for menstrual blood
- + human hemoglobin as control marker for human blood
- + test result in as fast as 10 minutes
- + ready-to-use, validated kit
- + buffer and card storable at room temperature

 **SERATEC**<sup>®</sup>  
EXCELLENCE IN FORENSIC BIOLOGY

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### INTERPRETATION OF RESULTS



Menstrual blood: positive



Menstrual blood: negative  
Peripheral blood: positive



Menstrual blood: negative  
Peripheral blood: negative

Invalid result: no control line

SERATEC<sup>®</sup> PMB Test is available in boxes with 8 or 30 cards each, dilution buffer included. Catalogue numbers: PMB/8 and PMB/30.

## INTRODUCTION

Identifying the biological source of a crime scene stain is one of the most important components in forensic science practice. A correct origin determination can be crucial for police investigations as it gives the investigators information about the course of the crime. Blood is one of the most commonly found body fluids at crime scenes, and accurate differentiation between peripheral blood and menstrual fluid provides valuable evidence regarding the issue of consent in sexual assault cases. While the presence of peripheral blood might indicate a traumatic cause, menstrual fluid might hint towards a natural bleeding cause. During menstruation, fibrinolysis occurs and is an important step to block blood coagulation and enable the menstrual fluid to easily pour out. A test was developed based on a D-dimer assay that detects degradation products of fibrinolysis and was tested for forensic purposes.

## METHOD

The immunochromatographic SERATEC® HemDirect test, which detects the presence of human hemoglobin in a sample and therefore detecting the presence of blood, was used as a basis for the development of a tool for the detection of D-dimer, a menstrual blood marker. Many types of samples, like dried and liquid menstrual blood, fresh and dried peripheral blood, different aged and sex were used for validation (see reference list). Forensic samples were included in the evaluation of the test's sensibility and protocol development. Additionally, it was also verified that the samples remained suitable for DNA extraction and analysis.

## RESULTS

The results showed that the SERATEC® PMB Test, a duplex D-dimer/hemoglobin assay, reliably detects the presence of human hemoglobin and, at the same time, identifies samples containing menstrual fluid. The product application distinguished between menstrual and peripheral blood from swabs in real casework samples from alleged sexual assaults as well as from an anthropological figurine (Holtkötter et al 2017).

In a further validation study, the SERATEC® PMB Test outperformed other menstrual blood detection techniques like microscopic examination, Lugol's Iodine Staining Method and Dane's Staining Method, in both sensitivity and accuracy (Bagwe, 2018). Fast reaction time, reproducibility and ease of use were found to be considerable benefits of the product.

The membrane of the reacted SERATEC® PMB Test card and the sample in the buffer remain a noticeable source of DNA. Both can be used as source of DNA extraction and typing (Holtkötter et al, 2017).

## CONCLUSIONS

SERATEC® PMB Test is a fast, reliable and validated method for the presumptive differentiation between menstrual and peripheral blood. The application of the test kit does not require special training and can be easily incorporated into the standard workflow of a crime laboratory.

## REFERENCES

- Bagwe, K. 2018. Evaluation of recently developed methods for the forensic detection of menstrual blood. MSc. School of Medicine, Boston University, Boston, USA, 67p.
- Holtkötter, H.; Dias Filho, C.R.; Schwender, K. et al. 2017. Forensic differentiation between peripheral and menstrual blood in cases of alleged sexual assault-validating an immunochromatographic multiplex assay for simultaneous detection of human hemoglobin and D-dimer. *Int. J. Legal Med.* 132(3):683-690. doi:10.1007/s00414-017-1719-y
- Wang, H. 2019. Evaluation of d-dimer in postmortem blood using the SERATEC PMB test. MSc. School of Medicine, Boston University, Boston, USA, 57p.