

VITAL PRECISION DIAGNOSTICS

- for patients with sepsis



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INTRODUCTION

Sepsis is a life-threatening condition that potentially contributes to 15% of all deaths every year in Denmark.¹ To be able to initiate targeted treatment quickly, a rapid and accurate diagnosis of pathogenic microorganisms is essential. Matrix-assisted laser desorption ionization – time of flight mass spectrometry (MALDI-TOF MS) has revolutionized the world for the precision diagnostics of bacteria.² When a blood culture system detects a positive vial, we are now able to make an extraction directly on the blood from the vial to get a faster identification of the pathogenic microorganisms.

OBJECTIVE

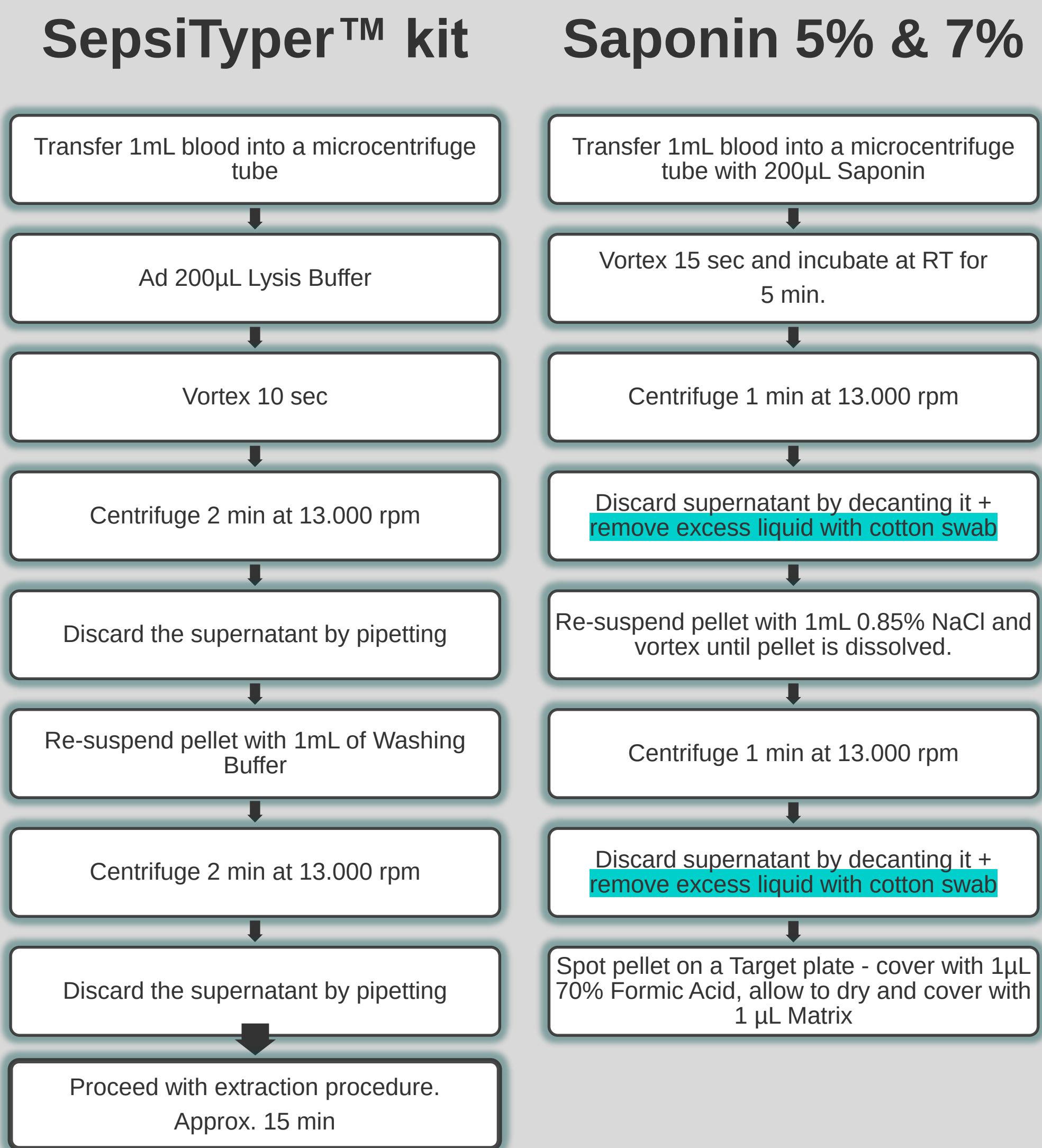
The objective is to optimize the precision diagnostics while comparing with the commercial kit Sepsityper™ for bacterial extraction from blood culture vials. Blood culture specimens that tested positive by BACTEC™ FX blood culture system (BD™), was included in this study. Various concentrations of Saponin dilutions are investigated and compared by MALDI-TOF MS scores (Bruker Daltonics™). Analytical performance and applicability are investigated to determine the preferred method for implementation in a routine laboratory.

METHODS

Extractions of bacterial blood culture pellets were performed with Sepsityper™, Saponin-5% and Saponin-7%, with subsequent identification by MALDI-TOF MS on 136 blood culture vials. 121 blood culture vials were monomicrobial and 15 were polymicrobial. The study was compared with results from the cultured colonies in the routine laboratory.

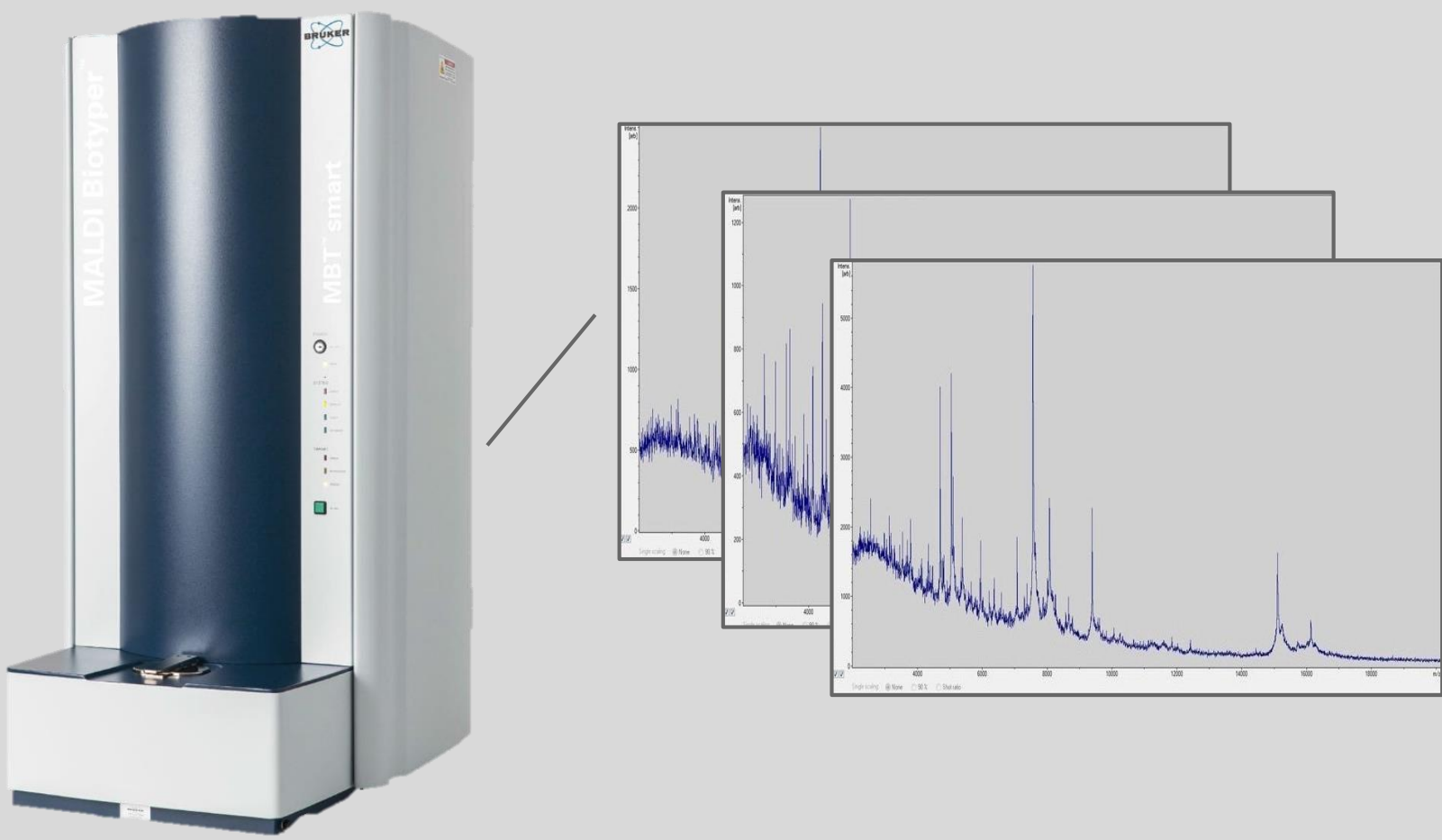
The process of the three metods is illustrated in the models depicted in the middle.

EXTRACTION METODS

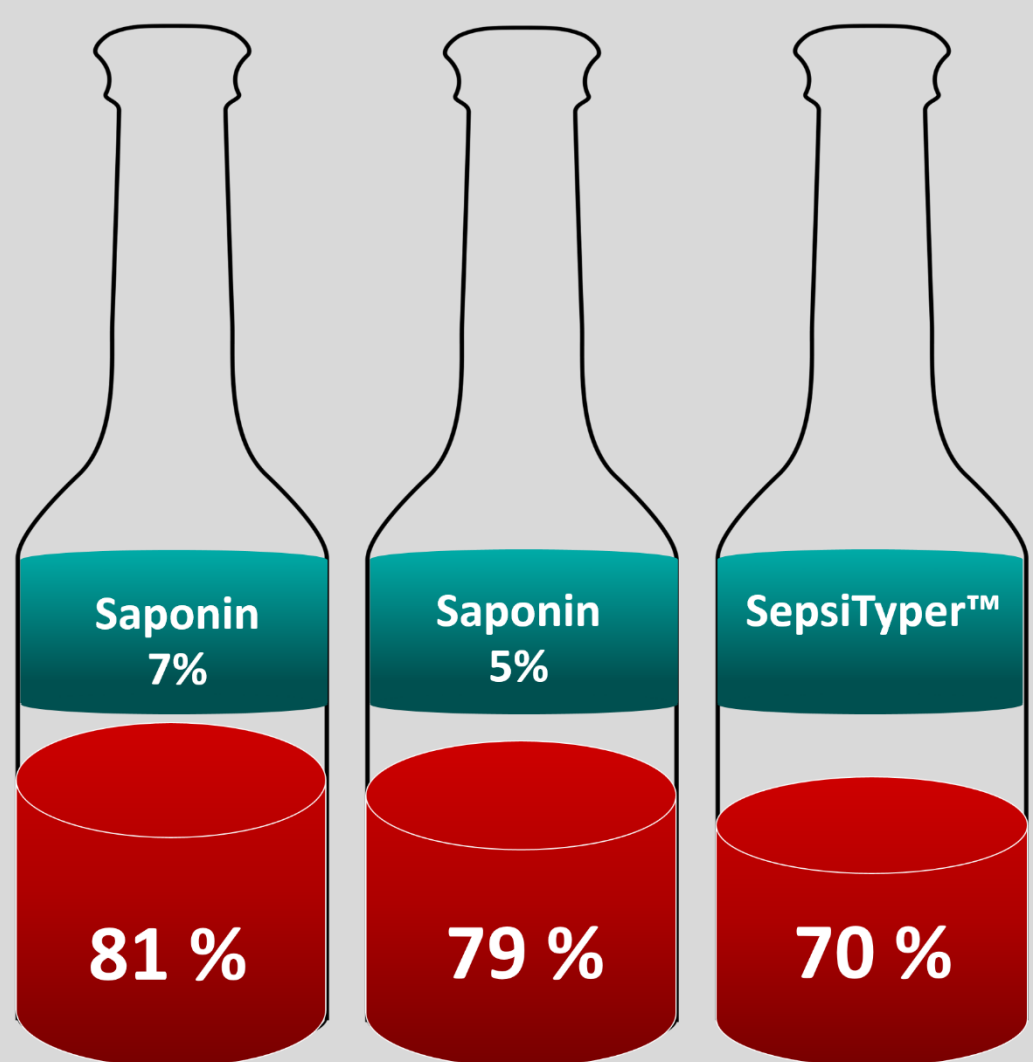


Mass spectrometry by MALDI-TOF ms

Cut-off: 1.8
ID species and genus level



Diagnostic sensitivity for all microorganisms in %



RESULTS

Of the 136 vials identified by MALDI-TOF MS, the overall diagnostic sensitivity is 81% for identification after extractions with Saponin-7%, 79% with Saponin-5% and 70% with Sepsityper™. The identification of Gram-positive bacteria showed a diagnostic sensitivity of 77% with Saponin-7%, 72% with Saponin-5%, and 65% with Sepsityper™. The identification of Gram-negative bacteria, the diagnostic sensitivity is 91% with Saponin-7%, 94% with Saponin-5%, and 82% with Sepsityper™.

Methods	Gram -	Gram +
7% Saponin	91%	77%
5% Saponin	94%	72%
Sepsityper™	82%	65%

DISCUSSION

This study reveals that extractions with Saponin-7% overall had the highest diagnostic sensitivity of the three extractions methods. The extraction methods with Saponin solutions are less time consuming and cheaper to use than Sepsityper™. We also found that by removing excess liquid with cotton swab, MALDI-TOF MS scores became higher. Due to the findings of this study, the Department of Clinical Microbiology, Rigshospitalet has introduced Saponin-7% as an extraction method of positive blood cultures and optimized a vital precision diagnosis for patients with sepsis.

REFERENCES

- Anders Perner et. al.(2018) Ugeskrift for Læger 2018;180:V09170685
- Bizzini A, Greub G (2010) MALDI-TOF ms, a revolution in clinical microbial identification. Clin Microbiol Infect 16:1614 - 1619

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