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An investigation of the compatibility of a new molecular transport medium (Sigma MM™) with a PCR analytical platform

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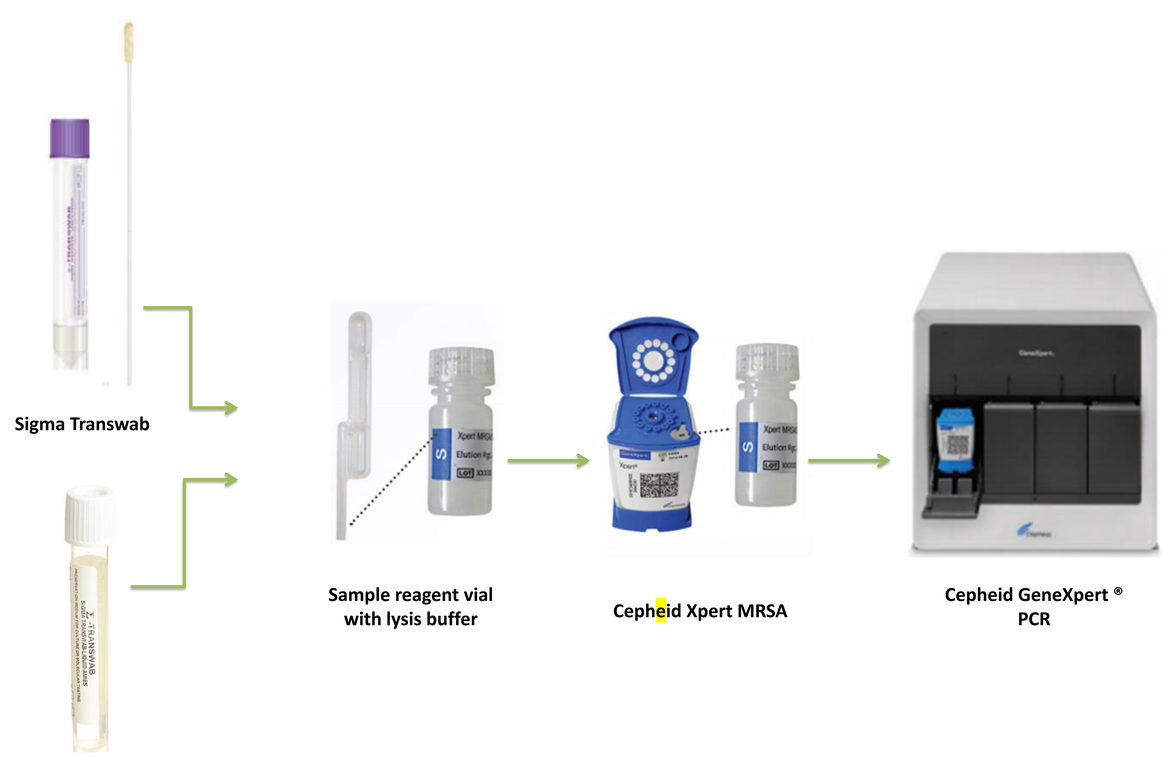
Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major nosocomial pathogen that causes severe morbidity and mortality worldwide (Cookson *et al.* 2011). In 2017/2018, a mandatory population-based bacteremia surveillance scheme reported a total of 12,784 MRSA bacteraemia and methicillin-susceptible S. aureus (MSSA) cases in England alone (PHE 2018). MRSA specimens represent a significant proportion of routine microbiological specimens and are very important for the management of critically ill patient. In recent years the introduction of self-contained cartridge systems for the rapid identification of target pathogens using nucleic acid amplification has transformed the ability of clinical microbiology laboratories to provide accurate and timely diagnostic data, allowing correct treatment to be commenced immediately, and also preventing unnecessary treatments. When culture is not required, it can be convenient and safer to transport the specimen in a medium which effectively inactivates the pathogen without disrupting the DNA or RNA so that analysis is still possible. If such a system is used, however, it is essential to know that the medium will be compatible with such an analysis.

This study we investigated the ability of Sigma MM™ , a liquid transport medium developed by Medical Wire and Equipment (MWE), to recover analytical quality DNA from specimens spiked with MRSA, while demonstrating that the biological pathogen had been inactivated and lysed. The PCR analysis was performed using Cepheid GeneXpert ® PCR analyser and Cepheid Xpert MRSA. The results for both PCR and culture were compared with those for identical specimens inoculated into Sigma-Transwab ® (MWE), a widely used transport swab device with liquid Amies.

Methods



Samples were spiked with known positive MRSA strain NCTC 12493.
A concentration of 0.5 McFarland bacterial was prepared in sterile saline and diluted 10^{-1},10^{-2}, and 10^{-3}. Aliquots of 100µl for each dilution were inoculated directly into the tubes of 6 Sigma Transwabs® and 6 Sigma MM™, giving a total of 18 inoculated devices for each type of device. A further 2 devices of each type were inoculated with 100µl of sterile saline as negative controls. After a holding time of 24 hours all devices were tested by inoculating into the test kits for GeneXpert, and by plating onto MRSA Chromogenic agar plates. Specimens for GeneXpert were processed according to the manufacturer's instructions. All agar plates were incubated at 37^{O}C for 18 hours.

This study was supported by MWE

Results

Table 1. MRSA findings on Cepheid GeneXpert ® PCR using Sigma-Transwab ® (MWE)

Dilution	Samples tested	Specimen collection device	GeneXpert result after 24 hours incubation	incubation culture growth results after 18 hours
10-1	6	Sigma-Transwab ®	Positive	Heavy
10-2	6	Sigma-Transwab ®	Positive	Moderate
10-3	6	Sigma-Transwab ®	Positive	Scanty
Negative control	2	Sigma-Transwab ®	Positive	No growth

Table 1. MRSA findings on Cepheid GeneXpert ® PCR using Sigma MM™(MWE)

Dilution	Samples tested	Specimen collection device	GeneXpert result after 24 hour incubation	incubation culture growth results after 18 hours
10-1	6	Sigma MM™	Positive	No growth
10-2	6	Sigma MM™	Positive	No growth
10-3	6	Sigma MM™	Positive	No growth
Negative control	2	Sigma MM™	Positive	No growth

Discussion and Conclusion

With reports of hospital-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) continuing to increase and therapeutic options decrease, infection control methods are of increasing importance. The launch of Sigma MM™, a commercial specimen inactivation/transport medium enables downstream molecular processing of MRSA sample. This screening strategy uses a testing modality with a rapid turnaround time (less than one hour) whilst inactivating the biological pathogen but preserving its DNA and RNA, therefore increases the capacity of laboratory technicians' to execute more demanding tasks.
This study has shown that the Sigma MM™ devices were compatible with the GeneXpert PCR analyser for MRSA. There was no interference with the chemistry. The Sigma MM™ devices were also completely effective at killing the MRSA at all concentrations, rendering the specimens non-infective.

References

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3. Edmond, M.B., Ober, J.F. and Bearman, G. (2008) "Active surveillance cultures are not required to control MRSA infections in the critical care setting", *Journal of Infection Control*, **36** (6), 461-463