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eSwab Nares Specimens Cultured with BioRad MRSA*Select*™ Media are Comparable to the Cepheid Xpert™ MRSA PCR for Use in MRSA Surveillance

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ABSTRACT

The purpose of this study was to evaluate and compare the BioRad MRSA*Select*™ media and the Cepheid Xpert™ MRSA PCR for MRSA surveillance at the Southern California Kaiser Permanente Regional Reference Laboratories. Culture specimens were collected with a Copan eSwab and plated to MRSA*Select* agar. All cultures positives were confirmed MRSA by Vitek®2. PCR specimens were collected with a Copan Venturi Transystem double-swab per the manufactures protocol. A total of 546 specimens were collected from two medical center ICUs for two months. A subset of specimens (n=230) were plated on blood agar plates (BAP) and MRSA*Select*. The BAP and MRSA*Select* cultures had a sensitivity of 51% and 99.4%, respectively. Overall the MRSA surveillance culture with MRSA*Select* demonstrated a positivity rate of 8.97%, while PCR demonstrated a positivity rate of 10.07%. No statistical performance differences were observed between the MRSA*Select* culture and Xpert MRSA (p >0.05). This study demonstrates that improved specimen collection using the eSwab in conjunction with culturing on MRSA*Select* media improves MRSA culture surveillance sensitivity without the need to perform an enrichment step.

INTRODUCTION

In January 2009, California legislation SB1058 required that certain high risk patients be screened for MRSA within 24 hrs of admission. In anticipation of the new legislation the Southern California Permanente Regional Laboratories performed a study to evaluate testing methodologies. The purpose of this study was to evaluate and compare the BioRad MRSA*Select*™ Agar and the Cepheid Xpert™ MRSA PCR for MRSA surveillance. This evaluation was part of a larger MRSA pilot study in which nares specimens were collected from high risk patients admitted to two medical center ICUs for two months.

Two swabs were collected for MRSA surveillance:

(i) A Copan eSwab for culture (BAP and/or MRSA*Select*)

(ii) A Copan Venturi Transystem double-swab for Xpert MRSA PCR

MATERIALS AND METHODS

Specimens Collected for MRSA Testing:

Nares specimens were collected from patients admitted to the ICU at two Southern California Permanente Medical Centers over a two month period. An eSwab (Copan Diagnostics, Murrieta, CA) was collected for culture (Figure 1a). A Copan Venturi Transystem double-swab (Copan Diagnostics, Murrieta CA) was collected for Xpert PCR, per the manufacturer's protocol. Swabs were collected in alternate order every other patient in order to avoid study bias.

MRSA Culture:

All specimen cultures were performed at the Southern California Permanente Regional Reference Laboratories. eSwabs were transported at room temperature. To validate the MRSA*Select* (BioRad Hercules, CA) media, BAP (BD Sparks, Maryland) media was also plated along side the MRSA*Select* plate until 230 specimens (37 MRSA*Select* positives) had been collected. After mixing, a total of 30 µL of eSwab media was pipeted to each media and streaked for isolation.

Plates were incubated in ambient air at 35-37°C for 24 hr ± 4 hr. If no mauve colonies were observed plates were reincubated for an additional 24 hrs (Figure 1b). All culture positive [MRSA *Select* or BAP] isolates were confirmed to be MRSA by Vitek®2 (bioMérieux, Marcy l'Etoile, France) ID and susceptibility. PCR positive, culture negative specimens were subject to broth enrichment with Tryptic Soy Broth (TSB) (B-D Sparks, Maryland) followed by plating to MRSA*Select* and BAP.

Xpert MRSA PCR:

Xpert MRSA PCR (Cepheid, Sunnyvale, CA) was performed according to the manufacturer's package insert (Figure 2). All Xpert PCR was performed on-site at each medical center collecting specimens. Secondary (BD Gen-Ohm™ MRSA Assay) or repeat (Xpert) PCR was performed on PCR negative, culture positives when possible. All invalid PCR results were repeated with the Xpert PCR.

Figure 1a. Copan eSwab used for MRSA culture

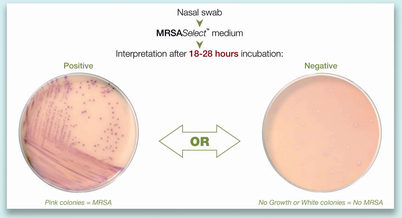

Figure 1b. MRSA*Select* agar used for MRSA surveillance cultures

Figure 2. Cepheid Xpert MRSA for PCR

RESULTS & DISCUSSION

A) Combined Medical Centers results MRSA*Select* vs BAP Resolved Data:

		BAP		
	n = 230	+	-	Total
MRSA Select	+	19	18	37
	-	0	193	193
	Total	19	211	230

- The 18 MRSA*Select* positive/BAP negative were confirmed to be MRSA by Vitek and 6/18 were PCR positive. The MRSA*select* allowed for improved recovery because of the mauve colored isolates (in some cases a single mauve colony was seen on the plate).

n = 230	Sensitivity	Specificity
BAP	51%	100%
MRSA*Select*	100%	98.4%

B) Combined Medical Center Results PCR vs MRSA*Select* Resolved data:

		MRSA*Select*		
	n = 542	+	-	Total
PCR	+	35	20	55
	-	14	473	487
	Total	49	493	542

- The 14 MRSA*Select* positive, PCR negative specimens were all confirmed to be MRSA by Vitek.
- 11/14 had a second PCR performed (either BDGen-Ohm or repeat Xpert) that repeated negative.

n = 542	Sensitivity	Specificity
MRSA*Select*	100%	99.2%
Xpert PCR	71.4%*	95.9%

* Low sensitivity may be due to a lack of PCR confirmation with a second PCR to confirm discrepant results as true positives.

- Three specimens that were initially MRSA*Select* positive/BAP negative/PCR negative were identified as either *S. epidermidis* or *S. hominis* by Vitek (only resolved data is presented above).
- The 20 MRSA*Select* negative, PCR positive, remained culture negative after TSB enrichment. No second PCR has been performed on these specimens to confirm they were true positives due to logistical issues and the stability of the swabs.
- The two screening methods demonstrated no statistical difference in MRSA rate when evaluated combined or by medical center (p >0.05). It is believed that the combined use of the eSwab and MRSA*Select* media optimized organism recovery allowing for results that were comparable to PCR.

SUMMARY

- The MRSASelect plates allow for the easy identification of MRSA from culture plates, thus allowing for improved isolation of MRSA.
- The overall MRSA rate by PCR and MRSA*Select* was 10.07% and 8.97%, respectively. No statistical difference in MRSA rates was observed when evaluated combined or by medical center (p >0.05).
- Improved specimen collection with the eSwab and use of the MRSA*Select* media appeared to optimize organism recovery allowing for results that were comparable to PCR. A study looking at the use of the eSwab with PCR is of interest.
- Both Xpert PCR and culture using eSwabs and MRSA*Select* plates are acceptable methods for screening for MRSA in high risk patients.
- When considering MRSA testing strategies, each laboratory will have to consider TAT needs, FTE resources, and capital equipment costs prior to implementation.

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