Evaluation of a Novel Agar Medium from Remel to Screen for Methicillin Resistant Staphylococcus aureus

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Abstract

Background

The development of reliable and rapid methods for the identification of patients colonized with methicillin-resistant Staphylococcus aureus is central to the prevention of person-to-person transmission of this agent within the hospital environment. To this end, we evaluated a chromogenic agar medium (Spectra™ MRSA) designed by Remel (Lenexa, KS) to recover MRSA from clinical specimens based on colony color.

Methods

We compared the performance of Spectra™ MRSA with mannitol salt agar (MSA), which is our current method. For this study, 670 nasal swabs were plated on each test medium and examined after overnight (16 to 24 hours) incubation. Denim-blue colonies growing on Spectra™ MRSA were subcultured and identified using standard bacteriological techniques. Yellow colonies on MSA were identified and oxacillin susceptibilities performed.
Results

After overnight incubation, the sensitivity and specificity were: MSA: 90%, 94%; Spectra™ MRSA: 98%, 99%. The positive predictive values for identification of MRSA were: Spectra™ MRSA 95%, MSA 58%. In addition, Spectra™ MRSA identified 5 isolates of MRSA that were not recovered using MSA. Further, when identifying MRSA from plates incubated for 24 hours, our data indicates comfirmatory testing such as a coagulase is not required.

Conclusions

We conclude that the Spectra™ MRSA provides improved recovery of MRSA from nasal swabs and the added advantage of confirming methicillin resistance.

Introduction

Methicillin-resistant Staphylococcus aureus (MRSA) is a significant cause of both community and hospital acquired infections, and its prevalence continues to increase. Since the mid-1990's the prevalence of MRSA in intensive care units has nearly doubled. MRSA has been associated with increased hospitalization, increased mortality, and increased cost of healthcare. MRSA infections increase the median length of hospital stay for nosocomial infections (median: 12 days for MRSA versus 4 days for methicillin-susceptible S aureus [MSSA]) and surgical site infections (SSIs) (median: 23 days for MRSA versus 14 days for MSSA). Increased length of hospitalization leads to increased per-patient hospital costs; in New York City, MRSA infections cost hospitals approximately $2500 to $3700 more (expressed in 1995 dollars) compared with MSSA. Direct hospital cost from nosocomial MRSA bacteremia is 2.8 times greater than that for MSSA bacteremia.

Due to the poor prognosis associated with MRSA infections, development of tools to rapidly identify MRSA is essential. To this end, Remel has developed a novel chromogenic agar to screen for MRSA. This chromogenic agar combines inhibitory agents with a chromogen to selectively identify MRSA directly from clinical specimens.

Figure 1A

Figure 1C

Figure 1

Spectra MRSA medium plated with methicillin-resistant Staphylococcus aureus and Mannitol Salt agar plated with methicillin-resistant Staphylococcus aureus. MRSA colonies growing on Spectra MRSA will appear denim blue, S. aureus colonies growing on MSA will appear yellow. For purposes of this study, nasal swabs were directly plated to Spectra MRSA and MSA and observed for growth at 24 and 48 hours.

Methods

Study enrollment and collection of clinical specimens

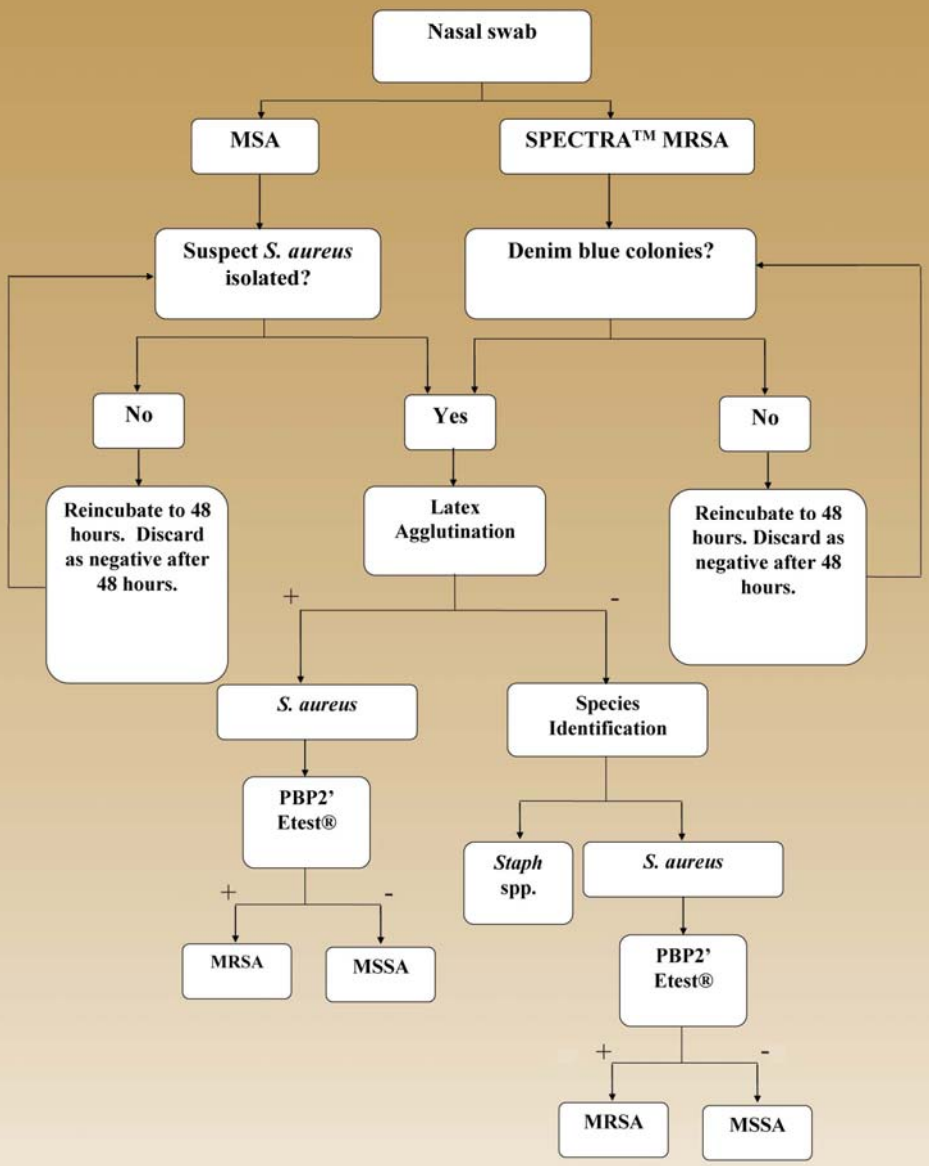
Study subjects were selected from both inpatients and outpatients submitting specimens to Dynacare Laboratories, a reference laboratory for Froedtert Hospital and the metropolitan Milwaukee area. Patients were considered for inclusion in the study if they had a nasal swab submitted for MRSA detection. Specimens submitted for this study were limited to either single or double swabs transported in liquid Stuart or Amies gel media. Collected specimens were transported and stored at 4°C up to 24 h before being plated on the control or experimental medium. This study was approved by the Medical College of Wisconsin Institutional Review Board.

Media and culture conditions

We compared the performance of the experimental chromogenic medium (Spectra™ MRSA; Remel, Lenexa, KS) with mannitol salt agar (MSA; Remel, Lenexa, KS), which is current method employed by our laboratory. Spectra™ MRSA and MSA plates were directly inoculated by rolling the collection swab on the first quadrant of the media and subculturing using the quadrant method (MSA plate was always inoculated first). Plates were incubated at 35°C and examined for growth at 24 and 48 h time points. Spectra™ MRSA plates with denim blue colonies were presumed positive for MRSA. MSA plates with yellow colonies were presumed positive for S. aureus. Following observation of the colony morphologies, individual unique colonies were subcultured onto Columbia blood agar plates for confirmatory identification and antimicrobial susceptibility testing using a Gram stain, catalase, and Staphaurex® (Remel, Lenexa, KS) tests. Oxacillin resistance was confirmed using the PBP2a test (Remel, Lenexa, KS) and a cefoxitin disk.

Methods

Figure 2. Description of overall study diagram



Methods

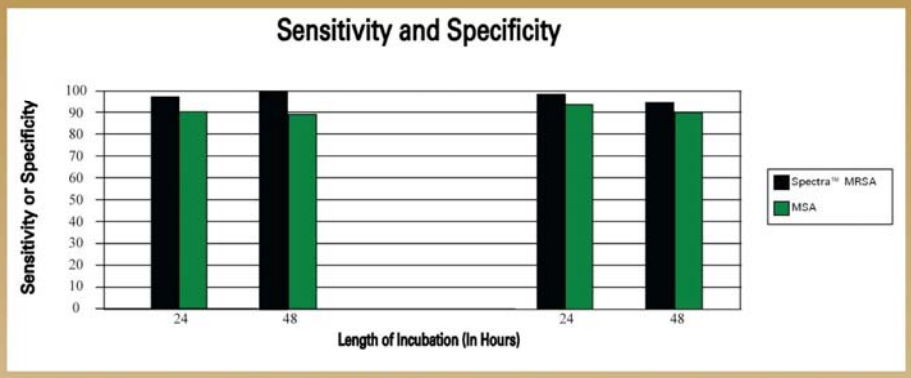


Figure 3. Sensitivity and specificity of Spectra MRSA and Mannitol salt agar. Subset analysis of 670 specimens collected in our study suggest extended incubation enhances sensitivity of Spectra MRSA to 100% while maintaining a specificity of 95%.

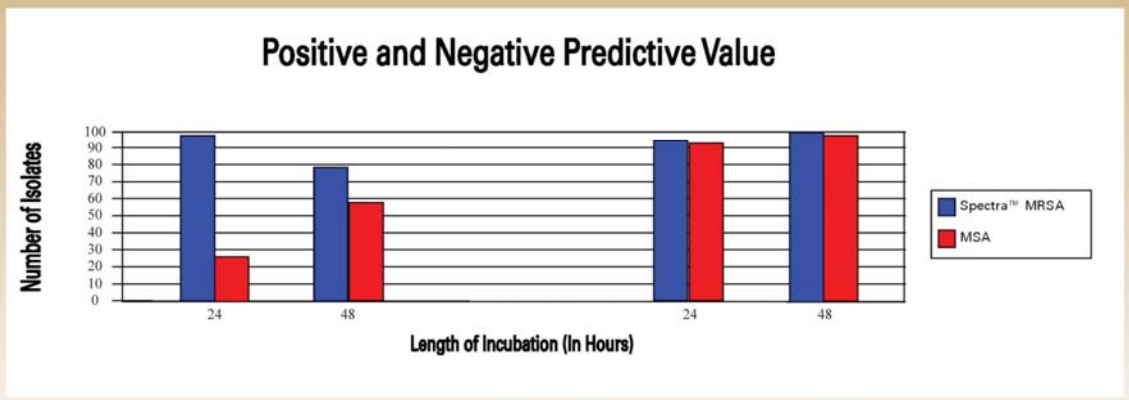


Figure 4. Positive and negative predictive values of SpectraMRSA and mannitol salt agar. Gold standard was PBP2a, catalase, and Staphaurex positive isolates growing on either media.

Conclusions

- The generated data shows that Spectra™ MRSA is a reliable method of MRSA detection in nasal specimens. The recovery rate is significantly higher than our current methodology.
- Great majority of MRSAs were recovered by Spectra™ MRSA between 18 to 24 hours suggesting that incubation of negative plates for additional 24 hours may not be necessary.
- The recovery of MRSA by Spectra™ MRSA is optimum at 24 hrs, as recommended by the package insert.
- Spectra™ MRSA improved the turnaround time in the reporting of MRSA, thus aiding more efficiency in the implementation of infection control measures when necessary.
- Spectra™ MRSA is an reliable and excellent alternative for laboratories that are considering in incorporating chromogenic media for the routine surveillance of MRSA