Evaluation of Two Chromogenic Media for MRSA Screening from Nasal Swabs

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Abstract

Background: Many hospitals have adopted a screening process to identify potential reservoirs of methicillin-resistant *Staphylococcus aureus* (MRSA) that includes nasal swab cultures inoculated to traditional or chromogenic media. The purpose of this study was to compare performance characteristics of two selective and differential MRSA chromogenic media, Bio-Rad MRSA*Select* and HardyCHROM MRSA, within a large hospital system clinical microbiology laboratory. Both media are designed for qualitative detection of MRSA from nasal & wound specimens. Additionally, Hardy's new claim for result interpretation at 24 hours was evaluated.

Methods: 429 nasal swab specimens were tested by Bio-Rad MRSA*Select* and HardyCHROM MRSA. All study specimens were inoculated to both media and incubated for 48 hours. All plates were examined at both 24 and 48 hour intervals for characteristic growth and color intensity as defined by the manufacturers. Colonies from samples with discordant results were further evaluated by PBP2a latex agglutination and MRSA PCR.

Results: Of 429 specimens, 37 were positive and 387 were negative by both media at 24 hours. There were 5 discordant results. Two specimens that were positive by Bio-Rad but negative by Hardy were also negative by MRSA PCR. Of two specimens that were negative by Bio-Rad but positive by Hardy, one was positive by PBP2a and MRSA PCR and one was negative by both tests. One sample was positive by Hardy and PBP2a analysis, but negative by Bio-Rad and PCR. Following discordant result resolution, overall relative sensitivity and relative specificity were 100% and 99.7% for Hardy, 97.4% and 99.5% for Bio-Rad. Positive and negative predictive values were 97.4% and 100% for Hardy, 94.9% and 99.7% for Bio-Rad. Of note, two specimens were noted to have false positive growth at 48 hours only by Hardy.

Conclusion: Bio-Rad MRSA*Select* and HardyCHROM MRSA accurately detect MRSA isolates from nasal swab specimens. HardyCHROM MRSA performs reliably at 24 hours, and is actually more accurate than a 48 hour interpretation. In our laboratory, visual clarity of the Hardy media was much preferred compared to the Bio-Rad product.

Introduction

The Microbiology section of Saint Luke's Regional Laboratories is staffed with 15 FTE's and functions as the core infectious disease testing laboratory for 9 hospitals within Saint Luke's Health System. The scope of service includes bacterial, fungal, AFB, and viral cultures as well as infectious disease serology. MRSA detection is performed by both culture and PCR, based on the ordering physician or infection prevention practitioners preference.

Accurate, timely detection of MRSA from screening specimens is imperative for appropriate intervention measures. Ideally, chromogenic media should provide results within an acceptable timeframe, produce characteristic colony growth that is easily distinguishable by technologists, and preclude the need for confirmatory testing.

Methods

Two commercially available selective and differential media from two manufacturers were evaluated. HardyCHROM MRSA and Bio-Rad MRSA*Select* are recommended for qualitative detection of MRSA from anterior nares swabs as well as skin and soft tissue wound specimens. On both HardyCHROM MRSA and Bio-Rad MRSA*Select* , growth of MRSA produces a pink to magenta colony via cleavage of chromogenic substrates in the medium. Both media contain inhibitory antibiotic and antifungal agents to prevent growth of other bacteria and yeast, including methicillin-susceptible *Staphylococcus aureus*. According to the package inserts, methicillin-resistant coagulase-negative staphylococci may appear as white (Bio-Rad) or blue (Hardy) colonies.

429 single nasal swab specimens were supplied by one of the manufacturers with no sample identifiers or information regarding prior MRSA testing results. The specimens were previously refrigerated, received in several batches, and were inoculated to both media simultaneously. Plates were incubated aerobically in the dark at 35-37 degrees C, and examined for growth and coloration at 24 and 48 hours, by two experienced microbiology technologists. Colonies from samples with discordant results were further evaluated by Alere PBP2a and Cepheid Xpert MRSA.

Results

Overall, 424 of 429 results (98.8%) were in agreement on initial culture interpretation at 24 hours. Both media yielded concordant results on 387 negative specimens and 37 positive specimens.

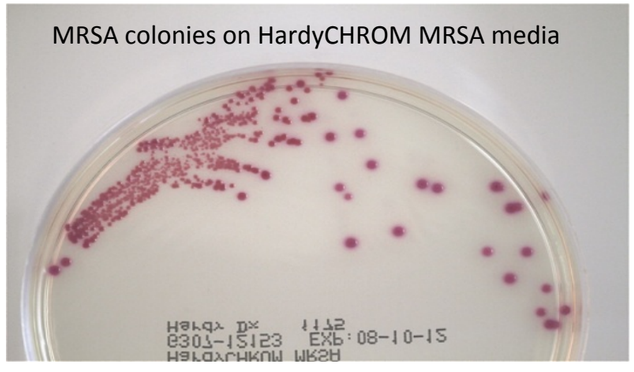
Five discordant samples were further characterized. Two specimens that were positive by Bio-Rad MRSA*Select* but negative by HardyCHROM MRSA were also negative by Xpert MRSA . Of two specimens that were negative by Bio-Rad but positive by Hardy, one was positive by PBP2a and Xpert MRSA and one was negative by both tests. One sample was positive by Hardy and PBP2a analysis, but negative by Bio-Rad and Xpert MRSA. This sample was deemed inconclusive & excluded from the final data analysis.

Following discordant resolution, the cumulative results and associated performance characteristics for each medium are as shown:

HardyCHROM MRSA (n = 428)

	Hardy Positive	Hardy Negative
Bio-Rad/PBP2a/Xpert MRSA Pos	**38**	**0**
Bio-Rad/PBP2a/Xpert MRSA Neg	**1**	**389**

Relative sensitivity=100% Relative specificity=99.7%
Positive predictive value=97.4% Negative predictive value=100%



Bio-Rad MRSA*Select* (n = 428)

	Bio-Rad Positive	Bio-Rad Negative
Hardy/PBP2a/Xpert MRSA Pos	**37**	**1**
Hardy/PBP2a/Xpert MRSA Neg	**2**	**388**

Relative sensitivity=97.4% Relative specificity=99.5%
Positive predictive value=94.9% Negative predictive value=99.7%

Discussion

- Performance characteristics are calculated in relative terms since "gold standard" results of traditional culture, PBP2a, or MRSA PCR results are not available for all samples.
- Prolonged exposure to light interferes with results from both media and may produce false-negatives. A manufacturer developed or other device for protection from light while plates are on the bench might prove beneficial.
- HardyCHROM MRSA recently received approval for reading at 24 hours. In our hands, results were more accurate at 24 hours, as two false positive specimens were produced by Hardy at 48 hours.
- Growth of non-MRSA organisms was observed on both media within the acceptable reading timeframe, appearing as white or blue colonies. Some strains of Staphylococcus epidermidis may appear faintly pink on MRSA*Select* per the package insert, which could result in inaccurate interpretation.
- HardyCHROM produces the most accurate results when read at 24 hours. In this investigation Bio-Rad MRSASelect was also interpreted at 24 hours, however the manufacturer suggests a timeframe of 18-28 hours is acceptable, which some laboratories may find more compatible with workflow.
- Interpretation of HardyCHROM MRSA was preferred by our technologists due to the transparency of the media, which improved their ability to visually detect colony growth.

Conclusion

Bio-Rad MRSA*Select* and HardyCHROM MRSA accurately detect MRSA isolates from nasal swab specimens. HardyCHROM MRSA performs reliably at 24 hours, and is actually more accurate than a 48 hour interpretation. In our laboratory, visual clarity of the Hardy media was much preferred compared to the Bio-Rad product.