

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY TEMPLATE**

A. 510(k) Number:

K042812

B. Purpose for Submission:

Premarket notification

C. Measurand:

Methicillin resistant *Staphylococcus aureus* (MRSA)

D. Type of Test:

Direct detection of MRSA from anterior nares specimens using specific chromogenic substrates and ceftioxin-qualitative assay

E. Applicant:

Becton, Dickinson and Company

F. Proprietary and Established Names:

BBL™ CHROMagar™ MRSA

G. Regulatory Information:

1. Regulation section:

866.1700

2. Classification:

II

3. Product code:

JSO Culture media, AST excluding Mueller Hinton agar/broth

4. Panel:

83 Microbiology

H. Intended Use:

1. Intended use(s):

BBL™ CHROMagar™ MRSA is a selective and differential medium for the qualitative direct detection of nasal colonization by methicillin resistant *Staphylococcus aureus* (MRSA) to aid in the prevention and control of MRSA infections in healthcare settings. The test is performed on anterior nares swab specimens from patients and healthcare workers to screen for MRSA colonization. BBL™ CHROMagar™ MRSA is not intended to diagnose MRSA infection nor to guide or monitor treatment for infections.

2. Indication(s) for use:

BBL™ CHROMagar™ MRSA can be used to establish MRSA colonization

3. Special conditions for use statement(s):

Prescription use

4. Special instrument requirements:

Not Applicable

I. Device Description:

BBL CHROMagar™ MRSA is a chromogenic medium incorporated with cefoxitin for the direct detection of methicillin resistant *Staphylococcus aureus* from anterior nares specimens. Other selective agents are also incorporated in the agar to suppress gram-negative organisms, most strains of *S. epidermidis* and yeasts.

J. Substantial Equivalence Information:

1. Predicate device name(s):

BBL™ Oxacillin Screen Agar

2. Predicate 510(k) number(s):

k863821

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended use:	For detection of MRSA	For detection of MRSA
Reporting	MRSA	MRSA
Reading	manual	manual

Differences		
Item	Device	Predicate
Inoculum	Direct anterior nares specimens	Isolated colonies from any source equated to a 0.5 McFarland
Incubation	24-48 hours at 35-37 °	24 hours at 30-35°
Antibiotic used	cefoxitin	oxacillin

K. Standard/Guidance Document Referenced (if applicable):

NCCLS M7-A6, Methods for Dilution Antimicrobial Susceptibility Testing; NCCLS M100-S13 Performance Standards for Antimicrobial Susceptibility Testing.

L. Test Principle:

BBL™ CHROMagar™ MRSA agar allows the direct detection and identification of MRSA with the use of specific chromogenic substrates and cefoxitin. MRSA strains will grow in the presence of cefoxitin and produce mauve-colored colonies resulting from hydrolysis of the chromogenic substrate. Additional selective agents are incorporated for the suppression of gram-negative organisms, some gram-positive organisms and yeast. Bacteria other than MRSA may utilize chromogenic substrates in the medium resulting in a blue/green colored colony or if no chromogenic substrate is utilized the colonies will appear as white or colorless.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Reproducibility was established at three sites using 10 *S. aureus* strains including both MRSA and MSSA. Reproducibility was >95%.

b. *Linearity/assay reportable range:*

Not Applicable

c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

Quality Control data was compiled across all three sites and all batches of CHROMagar™ MRSA agar for a total of 240 test results. All but one individual QC batch passed. The testing followed the recommendations of the QC strains listed in the package insert. This included the *S. aureus* ATCC® 25923 as a negative (MSSA) control and *S. aureus* ATCC 43300 as a positive (MRSA) control

d. *Detection limit:*

Not Applicable

e. *Analytical specificity:*

A collection of 416 organisms (203 *mecA* positive *S. aureus*, 91 *mecA* negative *S. aureus*, 86 coagulase negative staphylococci and 31 other organisms) were tested using the CHROMagar™ MRSA to determine the analytical sensitivity and specificity. Results produced a sensitivity of 90.6 % (184/203) and a specificity of 98.1% (206/210).

Interference Study

Eight commonly used medicinal substances, human blood and five types of specimen transport devices, were evaluated for potential interference of the chromogenic reaction on the CHROMagar MRSA medium. At a 10% concentration, a nasal spray containing phenylephrine hydrochloride demonstrated antibacterial activity on CHROMagar MRSA, as well as on the nonselective control, TSA II with 5% sheep blood.

f. *Assay cut-off:*

Not Applicable

2. Comparison studies:

a. *Method comparison with predicate device:*

The BBL™ CHROMagar™ MRSA was evaluated at four geographically diverse clinical sites. Surveillance cultures of the anterior nares were plated on Trypticase Soy Agar with 5% sheep blood (TSAII) as the reference method for recovery and then onto CHROMagar™ MRSA. Incubation of the TSAII was for 24 to 48 hours. Identification from the TSAII of *S. aureus* was by standard laboratory methods including a coagulase test. Susceptibility results (reference method) were determined using a microbroth dilution oxacillin MIC method (NCCLS recommended) and an oxacillin screen agar. Oxacillin

results with a MIC of ≤ 2 ug/mL were considered to be MSSA and results with a MIC of ≥ 4 ug/mL were considered to be MRSA when comparing this method. Additional testing included PCR *mecA* detection, PBP2' Latex Agglutination and cefoxitin disk diffusion (NCCLS method). CHROMagar™ MRSA was incubated for 24 hours (+/- 4 hours) and inspected visually for mauve colored colonies and if negative reincubated for an additional 24 hour (48 h reading). Mauve colonies were considered as MRSA if appearing during the 24 visual examination and morphologically resembling staphylococci colonies but were further identified if the mauve color appeared at the 48 hour reading by using morphology and coagulase testing with confirmatory testing to include PBP2' if the TSAII was negative for *S. aureus*. Testing included 1794 anterior nares specimens.

Percent agreement with each method as compared to the BBL™ CHROMagar™ is presented in the table below. Not all methods had all results available but the same set of MRSA and MSSA were tested in each system.

Method compared to	% agreement of MRSA	% agreement of MSSA
Ox MIC	94.9% (111/117) 95% CI-89.2%,98.1%	96.7% (201/208) 95% CI 93.2%-98.6%
Ox Screen Agar	94.9% (110/116) 95% CI 89.1%,98.1%	96.7% (202/209) 95% CI-93.2%,98.6%
Cefoxitin Disc	95% (112/118) 95% CI-89.3%,98.1%	98% (200/204) 95% CI-95.1,99.5%
PBP2' Latex agglutination	93.5% (115/123) 95% CI-87.6%,97.2%	98.5% (198/201) 95% CI-95.7%,99.7%
<i>mecA</i> PCR	95.7% (111/116) 95% CI-90.2%,98.6%	97% (196/202) 95%CI-93.6%,98.9%

An additional 89 mauve colored colonies were detected on the BBL™CHROMagar™ but no staphylococcus colonies were recovered by the TSA with sheep blood method. These were further identified as 15 MRSA. The remaining isolates were non *S. aureus*. Six of the BBL™CHROMagar mauve colonies were positive at 24 hours and further identified as coagulase-negative staphylococcus or gram positive rods. The instructions of the test does not recommend further testing when positive at 24 hours so these would be reported falsely as MRSA detected. An additional comment is added to the results section that any suspicious mauve colonies not resembling staphylococcus at 24 hours should be further identified to increase the overall agreement.

A challenge set of 20 MRSA, MSSA strains were tested at three sites with 100% agreement with the expected result.

b. *Matrix comparison:*

Not Applicable

3. Clinical studies:

a. *Clinical Sensitivity:*

Not applicable

b. *Clinical specificity:*

Not applicable

c. Other clinical supportive data (when a. and b. are not applicable):

Not applicable

4. Clinical cut-off:

Not applicable

5. Expected values/Reference range:

In the external clinical evaluation of CHROMagar MRSA, the overall prevalence of *S. aureus* colonization was 17.2% (340/1974), as detected by either the CHROMagar MRSA or Trypticase™ Soy Agar with 5% Sheep Blood (TSAII) plates. The overall prevalence of (non-duplicate patient) MRSA-positive specimens was 6.7% (132/1974), or about 39% (132/340) of all *S. aureus*. The TSAII plate MRSA-colonization detection rate was 6.5% (117/1794), while the CHROMagar MRSA rate of MRSA-colonization was 7.0% (126/1794).

N. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

O. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.