

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

A. 510(k) Number:

k070361

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 selective antifungal/antibiotics mixture

E. Applicant:

Bio-Rad

F. Proprietary and Established Names:

MRSASelect

G. Regulatory Information:

1. Regulation section:

CFR 866.1700

2. Classification:

II

3. Product code:

JSO: Culture media, Antimicrobial susceptibility test, excluding Mueller Hinton Agar

4. Panel:

83 Microbiology

H. Intended Use:

1. Intended use(s):

MRSASelect is a selective and differential chromogenic medium for the

qualitative detection of nasal colonization of methicillin resistant *Staphylococcus aureus* (MRSA) to aid in the prevention and control of MRSA infections in healthcare settings. The test can be performed on anterior nares specimens from patients and healthcare workers to screen for MRSA colonization. **MRSASelect** is not intended to diagnose MRSA infection nor to guide or monitor treatment of infection.

2. Indication(s) for use:

MRSASelect is indicated for the detection and direct identification of MRSA.

3. Special conditions for use statement(s):

Prescription use

4. Special instrument requirements:

Not applicable

I. Device Description:

MRSASelect is a selective and differential chromogenic medium for the qualitative detection of MRSA from anterior nares. Selective antifungal/antibiotics mixture is incorporated in the medium to inhibit the growth of yeasts, Gram negative and Gram positive bacteria except MRSA.

J. Substantial Equivalence Information:

1. Predicate device name(s):
BBL CHROMagar MRSA

2. Predicate 510(k) number(s):
k042812

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended Use	For detection of MRSA	For detection of MRSA
Reporting	MRSA	MRSA
Reading	Manual	Manual
Test methodology	selective media	selective media

Differences		
Item	Device	Predicate
Inoculum	Direct anterior nares and Indirect (saline)	Direct nasal swabs
Incubation	18 – 24 hours at 35 – 37°C	24 – 48 hours at 35 - 37°C
Antibiotic used	Antibiotics	cefoxitin

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

CLSI M100-S17 Performance Standards for Antimicrobial Susceptibility Testing;
 CLSI M29-A2 Protection of Laboratory Workers from Occupational Acquired Infections; CLSI M40-A Quality Control of Microbiological Transport Systems; Approved Standard

L. Test Principle:

MRSASelect is a selective medium for the detection and direct identification of MRSA. The selectivity of this medium is based on the presence of an antibiotic/antifungal mixture and an organized salt concentration that inhibits the growth of yeast and the majority of Gram negative and Gram positive bacteria with the exception of methicillin-resistant *staphylococci*. Identification is based on the cleavage of a chromogenic substrate by a specific enzymatic activity of *Staphylococcus aureus*, leading to a strong pink coloration of the *Staphylococcus aureus* colonies.

Within 18-24 hours incubation time:

- Methicillin-resistant *Staphylococcus aureus* produce small pink colonies on **MRSASelect**.
- Coagulase negative methicillin-resistant *staphylococci* do not metabolize the chromogenic substrate and appear as colorless or white colonies (possibly light pink).
- Methicillin sensitive *staphylococci* (MSS) are inhibited

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Reproducibility study was done at four sites. Testing was done at three sites in triplicates for three days with three lots. Duplicates were performed for three days with three lots at the fourth site. MRSA, MSSA and *S. epidermidis* were used. Reproducibility was >95%.

An additional 35 strains of bacteria and yeast were tested on three lots. No lot to lot variation was observed.

b. *Linearity/assay reportable range:*

Not applicable

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

Negative Control

S. aureus ATCC 25923 at a concentration of $10^4 - 10^5$ CFU/plate.

Positive Control

S. aureus ATCC 43300 at a concentration of $10^3 - 10^4$ CFU/plate.

Test Strain	Expected Results after 24 hours at 35-37°C
<i>S. aureus</i> ATCC 25923	No Growth
<i>S. aureus</i> ATCC 43300	Growth – small pink colonies

There were a total of 56 QC results from the three sites tested on more than three lots. The testing followed the recommendations of the QC strains listed in the package insert and there were no product failures.

d. *Detection limit:*

Not applicable

e. *Analytical specificity:*

To confirm the level of detection of MRSASelect, 31 strains of MRSA were plated on the media with a dilution at 10^3 CFU of a 0.5 MacFarland bacterial suspension. All strains grew on MRSASelect as small pink colonies after 24 hours incubation time.

To demonstrate the ability of MRSASelect to suppress the growth of organisms other than MRSA, 30 strains of methicillin sensitive

Staphylococcus aureus, and 20 strains of coagulase negative methicillin sensitive *Staphylococci* were tested by plating a 0.5 MacFarland bacterial suspension on the medium. Pink colonies were not observed on *MRSASelect* after 24-hour incubation time.

Interference Study

Two commonly used nasal sprays were evaluated for the potential interference on the performance of the *MRSASelect*. Three MRSA, two MSSA, two methicillin resistant coagulase negative *Staph* and others (*K. pneumoniae* and *C. albicans*) were tested on phenylephrine hydrochloride (1%) and oxymetazoline hydrochloride (0.05%). Bacterial growth was inhibited on the *MRSASelect* and the nonselective blood agar control medium. A limitation has been added to the package insert.

Four MRSA, three MSSA and one BORSA were used to test the interference effect of human blood, mucus and mucin (hog gastric) on *MRSASelect*. No significant interference was observed.

Four commonly used transport media were tested on the growth of MRSA on *MRSASelect*. There were no shifts of the bacterial count on either *MRSASelect* or TSA with 5% blood. The transport media did not impact the viability of MRSA.

Cross Reactivity Study

A Cross reactivity study was performed using 91 Coagulase negative *staphylococci* and 30 other organisms (Gram negative rods, *Strep pyogenes*, *N. meningitides*, *N. gonorrhoeae* and *Enterococci*). Of the Coagulase negative *staphylococci*, there were thirteen *S. epidermidis* with a false negative rate of 14.3% and one *S. capitis* that provided weakly pinkish colonies. A limitation has been included in the package insert that *S. epidermidis* may develop a faint pink coloration. Of the gram negative organisms, there were seven strains that showed pinkish coloration. The reaction was reduced with the reduction of the inoculum size (from 10^8 CFU to 10^5 CFU). A limitation has been added to caution the user of the potential color that might be observed with selected Gram negative rods.

f. *Assay cut-off:*

Not applicable

2. Comparison studies:

a. *Method comparison with predicate device:*

The *MRSASelect*TM culture media was evaluated at two clinical sites which included testing of 1772 anterior nares specimens. The recovery of MRSA on *MRSASelect* was compared to routine culture, which was defined as isolation of staphylococci on Trypticase Soy Agar with 5% blood, with identification confirmed by coagulase and oxacillin susceptibility. An additional 1241 samples were tested at a third site against a chromogenic medium, CHROMagar.

The optimum incubation time for *MRSASelect*TM culture media is 24 hours. At 24 hours, the culture media is visually inspected for small pink colonies which are considered as MRSA. Non-MRSA organisms appear as white or colorless colonies.

Percent agreement of *MRSASelect*TM for each method when compared to culture and another chromogenic media is presented in the table below.

Percent Agreement of *MRSASelect*TM

Method	MRSA	Non-MRSA
<i>MRSASelect</i> vs. routine culture	95.8% (227/237)	97.9% (1502/1535)
<i>MRSASelect</i> vs. a commercial chromogenic medium	94.3% (297/315)	99.1% (2674/2698)

Direct versus Indirect Inoculation

A total of 91 samples were analyzed to demonstrate that the direct and indirect inoculation procedures are equivalent. The percent agreement was 98%.

Retrospective Study

A retrospective study was evaluated at one site with 99 MRSA positive nasal swabs. At 24 hours, there were six that did not grow on the *MRSASelect*TM. The no growth rate for MRSA at 24 hrs was 6.0% (6/99). The percent of agreement was 94% (93/99) when comparing with the routine culture, and 96% (91/95) with a commercial chromogenic medium.

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:

The prevalence of MRSA infections has increased dramatically in hospitals and importantly the carriage rate of MRSA is rising in the community. Recent studies suggest that in the population at large this prevalence ranges between 25 – 30%.

N. Proposed Labeling:

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

O. Conclusion:

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