

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

A. 510(k) Number:

k042963

B. Purpose for Submission:

Addition of ertapenem to the Vitek® Antimicrobial Susceptibility Test (AST) System

C. Measurand:

Ertapenem $\leq 0.5 - \geq 32$ µg/ml

D. Type of Test:

Quantitative AST growth based detection

E. Applicant:

bioMerieux, Inc.

F. Proprietary and Established Names:

VITEK® Gram Positive Susceptibility Card

G. Regulatory Information:

1. Regulation section:

21 CFR 866.1645 Fully Automated Short-Term Incubation Cycle Antimicrobial Susceptibility System

2. Classification:

II

3. Product code:

LON System, Test, Automated, Antimicrobial Susceptibility, Short Incubation

4. Panel:

83 Microbiology

H. Intended Use:

1. Intended use(s):

The VITEK® Antimicrobial Susceptibility Test is intended to be used with the VITEK® System for the automated quantitative or qualitative susceptibility testing of isolated colonies for most clinically significant aerobic gram-negative bacilli, *Staphylococcus spp.*, *Enterococcus spp.*, *Streptococcus agalactiae*, and *S. pneumoniae*.

The VITEK® Gram Positive Susceptibility Card is intended for use with the VITEK® system in clinical laboratories as an in vitro test to determine the susceptibility of *staphylococci*, *enterococci* and *Group B* and *Group D streptococci* to antimicrobial agents when used as instructed in the “pinset” and operator’s manual.

2. Indication(s) for use:

This submission is for the addition of the antibiotic ertapenem at concentrations of 2, 4 and 8 ug/ml for a calling range of $\leq 0.5 - \geq 32$ ug/ml on the VITEK® Gram Positive Susceptibility Card.

3. Special conditions for use statement(s):

For prescription use

4. Special instrument requirements:

N/A

I. Device Description:

Each VITEK® test card contains 45 wells. The positive control well determines organism growth without antimicrobial inhibition. A suspension of the isolate to be tested is diluted with 0.45 – 0.5% sterile saline. The VITEK® Card is inoculated with the diluted suspension using a vacuum filling process in the VITEK® Filling Module. After the card is inoculated and placed inside the VITEK® Reader/Incubator, no further handling is required. Organism growth inside the card is optically monitored throughout the 6 – 15 hour incubation cycle.

J. Substantial Equivalence Information:

1. Predicate device name(s):

VITEK® Gram Positive Susceptibility Card for Gatifloxacin

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

N50510/S143

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended Use	Determine antimicrobial susceptibility to antimicrobial agents	Same
Test Organism	Gram Positive Cocci	Same
Test Card	VITEK® card format with base broth	Same
Instrument	VITEK® System	Same

Differences		
Item	Device	Predicate
Antibiotic	Ertapenem at specific concentrations	Gatifloxacin at specific concentrations
Reading algorithm	Unique for ertapenem	Unique for gatifloxacin

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

“Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test Systems; Guidance for Industry and FDA”; NCCLS M7 (M100-S14) “Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Approved Standard.”

L. Test Principle:

The VITEK® System determines when a well demonstrates growth (positive) based on the attenuation of light measured by optical scanner. Organism growth is expressed as increased turbidity in wells. Optical measurements are taken on an hourly basis. If during the 6 – 15 hour incubation cycle, bacterial growth occurs at levels equal to or greater than a predetermined threshold, regression analysis is utilized, along with the organism’s identification, to determine the appropriate minimum inhibitory concentration (MIC) value for the antimicrobial. At the completion of the incubation cycle, a report is generated that contains the MIC value along with the interpretive category result. The VITEK® Susceptibility Card test is based on the microdilution minimum inhibitory concentration technique with concentrations equivalent to standard method concentrations. Several parameters based on the growth characteristics observed are used to provide appropriate input for the MIC calculations. Discriminate analysis is used to develop the algorithm that determines the susceptibility result for all antimicrobials on the VITEK® system. The MIC result must be linked to organism identification in order to determine a category interpretation. A category interpretation will be reported along with a MIC.

M. Performance Characteristics (if/when applicable):1. Analytical performance:a. *Precision/Reproducibility:*

Reproducibility within sites was determined using the Quality Control (QC) isolates for >95% reproducibility. Between sites was performed at three sites for three days in triplicate for >95% reproducibility on 10 isolates.

b. *Linearity/assay reportable range:*

Not applicable

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

The recommended QC isolates were tested on every test occasion with the reference method and the VITEK®. The expected range for the *S. aureus* with the reference method was ≤ 0.25 µg/mL and QC results were in range for every day tested. The expected range for the *S. aureus* with the VITEK® was ≤ 0.50 µg/mL and was tested a sufficient number of times to demonstrate that the system can produce QC results in the recommended range. The mode for the Vitek® was different for the *S. aureus* and *E. faecalis* however, all results were still within the expected range. This demonstrated a slight trend for the Vitek® to be one dilution more resistant than the reference method result.

Quality Control Table

ORGANISM	Vitek® Conc.	Vitek®	Reference Conc.	Reference
<i>S. aureus</i>	0.50	86	0.25	73
ATCC 29213	1		0.50	2
Expected Range:	2		1	
0.06 – 0.25 µg/ml	4		2	
<i>E. faecalis</i>	4			
ATCC 29212	8	2		58
Expected Range:	16	83		16
4 - 16 µg/ml	≥ 32			

Inoculum density control was monitored using a colorimeter and colony count. This was standardized weekly with all results recorded and in the expected range. Verification was performed during internal testing.

A 0.5 McFarland is used to determine the correct inoculum. Colony counts were performed periodically at each site to demonstrate that the inoculum procedure results were in the expected CFU/ml.

- d. *Detection limit:*
Not Applicable
- e. *Analytical specificity:*
Not Applicable
- f. *Assay cut-off:*
Not Applicable

2. Comparison studies:

a. *Method comparison with predicate device:*

A clinical study was conducted at three sites using the VITEK® gram positive cards with ertapenem and the NCCLS reference agar dilution method using Mueller Hinton (MH) agar with and without 5% sheep blood prepared as recommended by the NCCLS. Inoculum was prepared with direct colony suspension. The testing included both fresh clinical isolates and stock isolates along with a challenge set with known results. The test device had a growth rate of >90%. Since Oxacillin Resistant isolates drive the call for the group, only the Oxacillin Sensitive isolates are evaluated. A comparison was provided to the reference method with the following agreement.

Summary Table for *Staphylococcus spp.*

	EA Tot	EA N	EA %	Eval EA Tot	Eval EA N	Eval EA %	CA N	CA %	#R	Min	maj	vmj
Clinical	138	138	100	3	3	100	137	99.3	0	1	0	0
Challenge	44	43	97.7	2	1	50	42	95.5	1	2	0	0
Combined	182	181	99.5	5	4	80	179	98.4	1	3	0	0

Streptococcus agalactiae is presented in the table below because it has different breakpoints than the *Staphylococcus spp.*

Summary Table for *Streptococcus agalactiae*

	EA Tot	EA N	EA %	Eval EA Tot	Eval EA N	Eval EA %	CA N	CA %	# NS
Clinical	59	59	100	0	0	0	59	100	0

Only clinical isolates were tested for the *S. agalactiae* group.

EA-Essential Agreement

CA-Category Agreement

R-resistant isolates

NS – Not susceptible isolates

maj-major discrepancies

vmj-very major discrepancies

min- minor discrepancies

Evaluable results are those that fall within the test range of the reference method and

could also be on-scale with the new device if within the plus/minus one well variability. EA is when there is agreement between the reference method and the VITEK® within plus or minus one serial two-fold dilution of antibiotic. CA is when the interpretation of the reference method agrees exactly with the interpretation of the VITEK® results.

- 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:
Staphylococcus spp. ≤ 2 (S), 4 (I), ≥ 8 (R)
Streptococcus agalactiae ≤ 1

The Interpretative criteria, QC isolates and the expected ranges are the same as recommended by the NCCLS and the FDA. All values will be included in the package insert.

The ability of the VITEK® system to detect resistance to ertapenem in *S. agalactiae* organisms is unknown because resistant organisms were not available at the time of comparative testing.

N. Proposed Labeling:

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

O. Conclusion:

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