

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

A. 510(k) Number:

k043230

B. Purpose for Submission:

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

C. Measurand:

Ertapenem $\leq 0.5 - \geq 8$ $\mu\text{g/mL}$

D. Type of Test:

Qualitative AST growth based detection

E. Applicant:

bioMerieux, Inc.

F. Proprietary and Established Names:

VITEK® Gram Negative 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 Negative Susceptibility Card is intended for use with the VITEK® system in clinical laboratories as an in vitro test to determine the susceptibility of rapidly growing aerobic and/or facultatively anaerobic, gram-negative bacilli 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 0.5, 1, and 2 ug/ml for a calling range of $\leq 0.5 - \geq 8$ $\mu\text{g/mL}$ on the VITEK® Gram Negative Susceptibility Card to provide qualitative results (SIR).

3. Special conditions for use statement(s):

For prescription use only

Qualitative SIR reading only, MIC results not available

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 Negative Susceptibility Card for Gatifloxacin

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

k032711

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended Use	Determine antimicrobial susceptibility to antimicrobial agents	Same
Test Organism	Gram Negative Bacilli	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 MIC value for the antimicrobial. 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 calculations. Discriminate analysis is used to develop the algorithm that determines the susceptibility result for all antimicrobials on the VITEK® system. An algorithm of using the 3 dilutions on the card allows for a calling range of $\leq 0.5 - \geq 8$ µg/mL. The AST result must be linked to organism identification in order to determine a category interpretation. A category interpretation (SIR) will be reported.

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 *E. coli* with the reference method was ≤ 0.25 $\mu\text{g/mL}$ and QC results were in range for every day tested. The expected range for the *E. coli* with the VITEK® was ≤ 0.50 $\mu\text{g/mL}$ 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 the same for the *E. coli* and *P. aeruginosa*.

Quality Control Table

ORGANISM	Vitek® Conc.	Vitek®	Reference Conc.	Reference
<i>E. coli</i>	≤ 0.50	66	≤ 0.25	66
ATCC 25922	1		0.50	
Expected Range:	2		1	
≤ 0.06 $\mu\text{g/ml}$	4		2	
<i>P. aeruginosa</i>	1		1	
ATCC 27853	2	2	2	14
Expected Range:	4	62	4	53
2 - 8 $\mu\text{g/ml}$	8	3	8	1

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 negative cards with ertapenem and the reference agar dilution method 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%. Essential agreement was not calculated because the Vitek card contained <5 dilutions of ertapenem. A comparison was provided to the reference method with the following agreement.

Summary Table for *Enterobacteriaceae spp.*

	CA Tot	CA N	CA %	#R	Min	maj	vmj
Clinical	301	297	98.7	2	4	0	0
Challenge	77	76	98.7	3	1	0	0
Combined	378	373	98.7	5	5	0	0

CA-Category Agreement
R-resistant isolates
min- minor discrepancies

maj-major discrepancies
vmj-very major discrepancies

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:
Enterobacteriaceae ≤ 2 (S), 4 (I), ≥8 (R)

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 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.