

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

**A. 510(k) Number:**

k041982

**B. Purpose of Submission:**

To include Ertapenem on the VITEK<sup>®</sup> 2 gram negative AST panel for testing appropriate Enterobacteriaceae.

**C. Analyte:**

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

**D. Type of Test:**

Quantitative growth based detection algorithm using optics light detection

**E. Applicant:**

bioMerieux, Inc.

**F. Proprietary and Established Names:**

VITEK<sup>®</sup> 2 Gram Negative Ertapenem

**G. Regulatory Information:**

1. Regulation section:  
866.1645 Short-Term Antimicrobial Susceptibility Test 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<sup>®</sup> 2 Antimicrobial Susceptibility Test (AST) is intended to be used with the VITEK<sup>®</sup> 2 System for the automated quantitative or qualitative susceptibility testing of isolated colonies for the most clinically significant aerobic gram-negative bacilli, *Staphylococcus spp.*, *Enterococcus spp.*, *Streptococcus agalactiae*, and *S. pneumoniae*.

The VITEK<sup>®</sup> 2 Gram Negative susceptibility Card is intended for use with the VITEK 2 System in clinical laboratories as an *in vitro* test to determine the susceptibility of clinically significant aerobic gram negative bacilli to antimicrobial agents when used as instructed in the Online Product Information.

2. Indication(s) for use:

This submission is for the addition of the antibiotic Ertapenem at concentrations at 0.5, 1, and 6 for a calling range of  $\leq 0.5$ - $\geq 8$ ug/mL to the VITEK<sup>®</sup> 2 gram negative susceptibility CARD for the testing of appropriate Enterobacteriaceae.

3. Special condition for use statement(s):

Prescription Use only.

The ability of the AST card to detect resistance among Enterobacteriaceae with ertapenem is unknown because resistant strains among the Enterobacteriaceae tested were not available at the time of comparative testing.

4. Special instrument Requirements:

Not applicable

**I. Device Description:**

Each VITEK<sup>®</sup> 2 test card contains 64 microwells. A control well, that contains only microbiological culture medium is resident on all cards, with the remaining wells containing premeasured amounts of a specific antibiotic combined with culture medium. A suspension of organism is made in 0.45 % sterile saline from a pure culture and standardized to a McFarland 0.5 standard using the DensiChek. The desired card (s) are placed in the cassette along with an empty tube for the susceptibility card. The cassette is placed into the VITEK<sup>®</sup> 2 instrument where a susceptibility test will be automatically diluted from the ID suspension by the VITEK<sup>®</sup> 2. The cards are then automatically vacuum filled; the tubes are cut and the cards sealed prior to proceeding to the incubator/reader for incubation (35.5° C) and optical scanning during testing. Minimal Inhibitory Concentration (MIC) readings are performed every 15 minutes.

There is also an alternate manual dilution method of the organism that is recommended in the package insert.

**J. Substantial Equivalence Information:**

1. Predicate device name(s):

VITEK<sup>®</sup> 2 Gram Negative AST Panel for gatifloxacin

2. Predicate K number(s):

K032788

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended Use	AST testing of gram negative bacilli	Same
Test organism	Colonies of <i>Enterobacteriaceae</i>	Same
Test Card	VITEK <sup>®</sup> 2 card format with base broth	Same
Instrument	VITEK <sup>®</sup> 2 System	Same
Differences		
Item	Device	Predicate
Antibiotic	Ertapenem	Gatifloxacin
Reading algorithm	Unique for Ertapenem	Unique for Gatifloxacin
Performance	Categorical interpretation	MIC and categorical

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

Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) 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:**

Optics systems use visible light to directly measure organism growth. These transmittance optics are based on an initial light reading of a well before significant growth has begun. Periodic light transmittance samplings of the same well measure organism growth by how much light is prevented from going through the well. An interpretive call is made between 4 and 16 hours for an early reading of results with an option to incubate up to 18 hours if necessary. The VITEK<sup>®</sup> 2 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<sup>®</sup> 2 system. The MIC result must be linked to an organism identification in order to determine a category interpretation. A category interpretation will be reported.

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

Ten on-scale gram negative organisms were tested in triplicate at each of three sites for three days for an overall inter reproducibility of >95%. Ten on-scale organisms were also tested at each site three times each to determine intra reproducibility of >95%. This testing was performed using both the manual dilution of the inoculum and also the automatic dilution method.

b. *Linearity/assay reportable range:*

Not applicable

c. *Traceability (controls, calibrators, or method):*

Quality Control was performed during the studies using both the auto-dilution and the manual method of diluting the organisms. This included the two recommended QC organisms with the following results.

<i>ORGANISM</i>	<b>VITEK® Conc.</b>	<b>Auto- dilution</b>	<b>Manual dilution</b>	<b>Reference Manual dilution</b>
<i>E. coli</i> ATCC 25922 Range 0.004-0.016 ug/mL	≤ 0.5	83	66	149
	1			
	2			
	4			
	8			
	≥ 16			
<i>P. aeruginosa</i> ATCC 27853 Range 2-8 ug/mL	≤ 0.5			
	1			
	2			36
	4			111
	8	84	67	4
	≥ 16			

Inoculum density control: Internal verification of the DensiChek was performed using 2 ATCC organisms and five instruments with 50 results available for each organism. The clinical sites also performed weekly standardization of the DensiChek used at that site. All recorded calibrated values were within acceptable parameters.

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 comparison of the clinical data was performed to the agar dilution reference method described in the NCCLS M7.

*Enterobacteriaceae* were tested at three sites that included both clinical and challenge isolates. All of the test organisms that

provided results did so in <16 hours. Testing was performed using the auto dilution feature. The overall performance is listed in the table below:

	total	CA	%CA	#R	min	maj	vmj
<b>Clinical</b>	330	327	99.1	2	3	0	0
<b>Challenge</b>	73	71	97.3	4	3	0	0
<b>Combined</b>	403	398	98.8	6	6	0	0

**maj**- major discrepancies

**CA**-Category Agreement

**R**-resistant isolates

**vmj**-very major discrepancies

**min**- minor discrepancies

CA is when the interpretation of the reference method agrees exactly with the interpretation of the VITEK<sup>®</sup> 2 result. Essential agreement at the time of clearance was not established because insufficient dilutions of the antibiotic were tested. The CA was acceptable at the time for a break-point [sensitive-intermediate-resistant (SIR)] categorization.

#### Manual Dilution:

The challenge set of organisms was also tested at one site using the manual method of inoculation with the following performance that demonstrated that there was little or no difference between the two inoculation methods.

#### Manual testing

	total	CA	%CA	#R	min	maj	vmj
<b>Challenge</b>	73	71	97.3	4	3	0	0

The test device had a growth rate of >95%.

#### *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*  $\leq 2$  (S), 4 (I),  $\geq 8$  (R)

The expected value range, interpretative criteria and QC are the same as recommended in NCCLS and FDA.

**N. Conclusion:**

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