

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

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

k052311

**B. Purpose of Submission:**

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

**C. Analyte:**

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

**D. Type of Test:**

Qualitative growth based detection algorithm using optics light detection

**E. Applicant:**

bioMerieux, Inc.

**F. Proprietary and Established Names:**

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

**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):

Tigecycline at concentrations at 0.75, 2, and 4 is intended to be used on the VITEK<sup>®</sup>2 Gram Negative susceptibility Card with the VITEK<sup>®</sup> 2 Antimicrobial Susceptibility Test (AST) on 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.

The VITEK<sup>®</sup> 2 Antimicrobial Susceptibility Test (AST) with the VITEK<sup>®</sup> 2 System is intended for the automated quantitative or qualitative susceptibility testing of isolated colonies for the most clinically significant aerobic gram-negative bacilli, and gram positive organisms: *Staphylococcus spp.*, *Enterococcus spp.*, *Streptococcus agalactiae*, and *S. pneumoniae* when used as instructed in the Online Product Information.

2. Indication(s) for use:

This submission is for the addition of the antibiotic Tigecycline at concentrations at 0.75, 2, and 4 for a calling range of  $\leq 0.5$ - $\geq 8\mu\text{g/mL}$  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 Tigecycline 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. Minimum 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 Ertapenem

2. Predicate K number(s):

K041982

3. Comparison with predicate:

<b>Similarities</b>		
<b>Item</b>	<b>Device</b>	<b>Predicate</b>
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
Performance	Categorical interpretation	Same
<b>Differences</b>		
<b>Item</b>	<b>Device</b>	<b>Predicate</b>
Antibiotic	Tigecycline	Ertapenem
Reading algorithm	Unique for Tigecycline	Unique for Ertapenem

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

Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems; Guidance for Industry and FDA”; CLSI M7 (M100-S15) “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 and intra-reproducibility of >95%. This testing was performed using both the manual dilution of the inoculum and also the automatic dilution method with acceptable results for both.

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 one recommended QC organism with the following results.

ORGANISM	VITEK <sup>®</sup> Conc.	Auto-dilution	Manual dilution	Reference Conc.	Reference
<i>E. coli</i> ATCC 25922 Range 0.03-0.25 ug/mL				≤0.0625	5
				0.125	80
				0.25	62
	≤0.5	83	66	0.5	
	1			1	2
	2			2	
	4			4	
	≥8			8	

				$\geq 16$	
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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 CLSI M7 Standard. *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:

	<b>total</b>	<b>CA</b>	<b>%CA</b>	<b>#R</b>	<b>min</b>	<b>maj</b>	<b>vmj</b>
<b>Clinical</b>	321	302	94.1	5	17	2	0
<b>Challenge</b>	73	60	82.2	2	11	2	0
<b>Combined</b>	394	362	91.9%	7	28	4	0

**maj-** major discrepancies

**CA-**Category Agreement

**R-**resistant isolates

**vmj-**very major discrepancies

**min-** minor discrepancies

CA is when the interpretation of the VITEK<sup>®</sup> 2 result agrees exactly with the interpretation of the reference method. Essential agreement at the time of clearance was not established because less than five discrete dilutions of the antibiotic were evaluated. A minimum of five dilutions is necessary to perform essential agreement (EA) based on +/- one two fold dilution. The CA was acceptable for a break-point [sensitive-intermediate-resistant (SIR)] categorization.

Challenge testing:

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

	<b>total</b>	<b>CA</b>	<b>%CA</b>	<b>#R</b>	<b>min</b>	<b>maj</b>	<b>vmj</b>
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Manual	74	61	82.4	2	10	3	0
Automated	73	60	82.2	2	11	2	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* ≤ 2 (S), 4 (I), ≥ 8 (R)

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

#### **N. Conclusion:**

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