

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

A. 510(k) Number:

k062945

B. Purpose for Submission:

Addition of ertapenem to the BD Phoenix™ Automated Microbiology System

C. Measurand:

Ertapenem at 0.25-32 µg/ml

D. Type of Test:

Antimicrobial Susceptibility Test (AST) (Quantitative and Qualitative) colorimetric oxidation-reduction, growth-based

E. Applicant:

Becton, Dickinson & Company

F. Proprietary and Established Names:

BD Phoenix™ Automated Microbiology System –Ertapenem Gram Negative Panel

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):

Ertapenem at 0.25-32 µg/mL on the GN ID/AST or AST only Phoenix panels is intended for use with the BD Phoenix Automated Microbiology System for the *in vitro* rapid identification (ID) and quantitative determination of antimicrobial susceptibility by minimal inhibitory concentration (MIC) of most Gram-negative aerobic and facultative anaerobic bacteria isolates from pure culture for *Enterobacteriaceae* and non – *Enterobacteriaceae*.

2. Indication(s) for use:
This submission is for the addition of the antibiotic ertapenem at concentrations of 0.25-32 µg/mL to the gram negative susceptibility panel for testing *Enterobacteriaceae*.
3. Special conditions for use statement(s):
For prescription use only
4. Special instrument requirements:
Not Applicable

I. Device Description:

This submission is for AST Panel only. The ID System was not reviewed.

The BD Phoenix™ Automated Microbiology System includes instrumentation and software, sealed and self-inoculating molded polystyrene trays with 136 micro-wells containing dried reagents, and specific inoculum broth formulations for ID and AST Indicator. The organism to be tested must be a pure culture and be preliminarily identified as gram positive or gram negative. Colonies are then suspended in broth, and equated to a 0.5 McFarland with the recommendation to use the BD CrystalSpec™ Nephelometer. A further dilution is made into an AST broth, which contains an AST indicator, prior to inoculating the panel. The AST broth is a cation-adjusted formulation of Mueller-Hinton broth containing 0.01% Tween 80. After adding the indicator solution to the AST inoculum the color is blue and after inoculation and incubation goes to pink to colorless as reduction in the panel well proceeds. Inoculated panels are barcode scanned and loaded into the BD Phoenix™ Automated Microbiology System instrument where the panels are continuously incubated at 35°C. The AST has a final inoculum of 5×10^5 CFU/ml. The instrument incubates, reads and records the results of the biochemical substrates and antimicrobial agents and interprets the reactions to give an ID of the isolate and MIC value and category interpretation of the antimicrobial agents. Organisms growing in the presence of a given antimicrobial agent reduce the indicator, signaling organism growth and resistance to the antimicrobial agent. Organisms killed or inhibited by a given antimicrobial do not cause reduction of the indicator and therefore do not produce a color change. Additional interpretation is done using software driven “EXPERT” System using rules derived from the CLSI standards.

Readings are taken every 20 minutes with an AST result available between 4-16 hours. This is only an autoread result; there are no manual readings possible.

J. Substantial Equivalence Information:

1. Predicate device name(s):
VITEK® System
2. Predicate 510(k) number(s):

N50510

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Intended Use	Intended for the <i>in vitro</i> rapid identification (ID) and quantitative determination of antimicrobial susceptibility by minimal inhibitory concentration (MIC) of most bacteria.	Same
Isolates	Isolated colonies from culture used	Same
Results Reported	Report results as minimum inhibitory concentration (MIC) and categorical interpretation (SIR)	Same
Incubation time	<16 hours	Same

Differences		
Item	Device	Predicate
Method of determining Results	Results are determined from serial twofold dilutions of antimicrobial agents	Results are determined from extrapolation of doubling dilutions
Inoculum Used	Inoculum density equated to 0.5 McFarland standard	Inoculum density equated to 1.0 McFarland standard
Technology	Automated growth based enhanced by use of a redox indicator (colorimetric oxidation-reduction) to detect organism growth.	Automated growth based with detection using an attenuation of light measured by an optical scanner.

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

“Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test Systems; Guidance for Industry and FDA”; CLSI M7 (M100-S16) “Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Approved Standard.”

L. Test Principle:

The system employs conventional, colorimetric, fluorogenic and chromogenic substrates to identify the genus and species of the isolate. The AST portion of the BD

Phoenix™ Automated Microbiology System is a broth based microdilution method that utilizes a redox indicator (colorimetric oxidation-reduction) to enhance detection of organism growth. The MIC is determined by comparing growth in wells containing serial two-fold dilutions of an antibiotic to the growth in “growth control wells” which contains no antibiotic.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Twelve gram-negative on-scale organisms were evaluated for site to site and inter site reproducibility demonstrating >95% reproducibility. The ten isolate study described in the guidance document was used (10 organisms tested 3 times on 3 days at 3 sites).

b. *Linearity/assay reportable range:*

Not applicable

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

The recommended Quality Control isolate was tested on every test occasion with the reference method and the BD Phoenix™. When the reference method was out of the expected range the test results were not included. The Phoenix™ was tested a sufficient number of times to demonstrate that the system can produce QC results in the recommended ranges most of the time. The table below demonstrates the frequency of results at the concentrations tested. The expected ranges are also stated.

ORGANISM	conc.	Reference	Phoenix™
<i>E. coli</i> ATCC 25922 Expected Range: ≤ 0.25 µg/ml	≤ 0.25	195	198
	0.5		
	1		
	2		
<i>P. aeruginosa</i> ATCC 27853 Expected Range: 2-8 µg/mL	≤ 0.25		1
	0.5	1	
	1	28	8
	2	153	117
	4	13	73
	8		
	16		
	32		

Inoculum density control: The organism suspension density of the broth was equivalent to a 0.5 McFarland standard using the BBL™ CrystalSpec™

Nephelometer which was verified each day of testing. Internal data was used to demonstrate that the use of the BBL™ CrystalSpec™ Nephelometer would produce reproducible results. Five different instruments were used.

- 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:*
The CLSI recommended broth dilution reference panel was prepared according to the CLSI recommendation. Clinical testing was performed at four sites. 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 >95%. A comparison was provided to the reference method with the following agreement.

Summary Table for *Enterobacteriaceae spp.*

	EA Tot	EA N	EA %	Eval EA Tot	Eval EA N	Eval EA %	CA N	CA %	#R	min	maj	vmj
Clinical	1288	1268	98.4	71	60	84.5	1272	98.8	10	12	4	0
Challenge	92	92	100	5	5	100	91	98.9	3	1	0	0
Combined	1380	1360	98.6	76	65	85.5	1363	98.8	13	13	4	0

EA-Essential Agreement
CA-Category Agreement
R-resistant isolates

maj-major discrepancies
vmj-very major discrepancies
min- minor discrepancies

Essential agreement (EA) is when the BD Phoenix™ panels agree with the reference test panel results exactly or within one doubling dilution of the reference method. Category agreement (CA) is when the BD Phoenix™ panel result interpretation agrees exactly with the reference panel result interpretation.

- 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 FDA. All values will be included in the package insert.

N. Proposed Labeling:

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

O. Conclusion:

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