510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number

K253573

B Applicant

Q-linea AB

C Proprietary and Established Names

ASTar BC G- Kit

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
SAN	Class II	21 CFR 866.1650 - A Cellular Analysis System For Multiplexed Antimicrobial Susceptibility	MI - Microbiology
LON	Class II	21 CFR 866.1645 - Fully automated short-term incubation cycle antimicrobial susceptibility system	MI - Microbiology

II Submission/Device Overview:

A Purpose for Submission:

To obtain a substantial equivalence determination for the ASTar BC G- Kit, previously cleared for use with the ASTar Instrument in K221688, to:

1. Expand the Indications for Use to include testing with cefotaxime, cefoxitin, ceftolozane-tazobactam, ceftriaxone, and ertapenem
2. Expand the Indications for Use to include testing of additional species with FDA STIC-recognized breakpoints for previously claimed drugs
3. Remove performance limitations for aztreonam, cefepime, piperacillin-tazobactam, and tobramycin

4. Reanalyze data to establish performance with updated FDA STIC-recognized breakpoints for amikacin, cefepime, gentamicin, and tobramycin
5. Establish a Predetermined Change Control Plan (PCCP) to address future revisions to device labeling in response to breakpoint changes that are recognized on the FDA STIC webpage

B Measurand:

Antimicrobial	ASTar Reporting Range (µg/mL)		
	Acinetobacter spp.	Enterobacterales	*P. aeruginosa*
Amikacin	≤2 to ≥256	≤2 to ≥256	-
Ampicillin-sulbactam	≤1 to ≥128	≤1 to ≥128	-
Aztreonam	-	≤0.5 to ≥128	≤0.5 to ≥128
Cefazolin	-	≤0.25 to ≥32	-
Cefepime	-	≤0.25 to ≥128	≤0.25 to ≥128
Cefotaxime	-	≤0.25 to ≥16	-
Cefoxitin	-	≤1 to >128	-
Ceftazidime	≤0.5 to ≥128	≤0.5 to ≥128	-
Ceftazidime-avibactam	-	≤1 to ≥64	≤0.125 to ≥64
Ceftolozane-tazobactam	-	≤0.25 to ≥64	≤0.25 to ≥64
Ceftriaxone	-	≤0.25 to ≥16	-
Cefuroxime	-	≤1 to >128	-
Ciprofloxacin	-	≤0.125 to ≥16	≤0.125 to ≥16
Ertapenem	-	≤0.06 to ≥16	-
Gentamicin	-	≤0.25 to ≥64	-
Levofloxacin	-	≤0.125 to ≥32	≤0.125 to ≥32
Meropenem	≤0.06 to ≥128	≤0.125 to ≥64	≤0.06 to ≥128
Meropenem-vaborbactam	-	≤0.5 to ≥64	-
Piperacillin-tazobactam	≤1 to ≥512	≤1 to ≥512	-
Tobramycin	-	≤0.125 to ≥64	≤0.125 to ≥64
Trimethoprim/sulfamethoxazole	-	≤0.25 to ≥16	-

Please refer to K221688 Decision Summary for more information of previously cleared antimicrobials.

C Type of Test:

Quantitative antimicrobial susceptibility test (AST) system that utilizes high-speed, time-lapse microscopy imaging of organisms in positive blood culture samples to determine the minimum inhibitory concentration (MIC) of specific antimicrobial-organism combinations.

III Intended Use/Indications for Use:

A Intended Use(s):

The ASTar System is intended to be used for the automated quantitative susceptibility testing for most clinically significant microorganisms. The ASTar System does not provide organism identification.

B Indication(s) for Use:

The ASTAar System, comprised of the ASTar Instrument with the ASTar BC G− Kit (ASTar BC G− Consumable kit, ASTar BC G− Frozen Insert, and ASTar BC G− Kit software), utilizes high-speed, time-lapse microscopy imaging of bacteria for the in vitro, quantitative determination of antimicrobial susceptibility of on-panel gram-negative bacteria. The test is performed directly on positive blood culture samples signaled as positive by a continuous monitoring blood culture system and confirmed to contain Gram-negative bacilli by Gram stain. Organism identification is required for AST result interpretation and reporting.

Test results from the ASTar BC G− Kit should be interpreted in conjunction with other clinical and laboratory findings. Standard laboratory protocols for processing positive blood cultures should be followed to ensure availability of isolates for supplemental testing. Sub-culturing is necessary to support further testing for: bacteria and antimicrobials not on the ASTar BC G− panel, where inconclusive results are obtained, epidemiologic testing, recovery of organisms present in microbial samples, and susceptibility testing of bacteria in polymicrobial samples.

Testing is indicated for *Acinetobacter* spp. Enterobacterales, and *Pseudomonas aeruginosa*, as recognized by the FDA Susceptibility Test Interpretive Criteria (STIC). The ASTar BC G- Kit with ASTar system has demonstrated acceptable performance with the following organisms:

Amikacin: *Acinetobacter* spp. (*Acinetobacter baumannii* complex), Enterobacterales (*Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group*, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Ampicillin: Enterobacterales (*Escherichia coli, Proteus mirabilis*)

Ampicillin-sulbactam: *Acinetobacter* spp. (*Acinetobacter baumannii* complex), Enterobacterales (*Citrobacter koseri, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae* group*, Morganella morganii, Proteus mirabilis, Proteus vulgaris*)

Aztreonam: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca*, *Klebsiella pneumoniae* group, *Morganella morganii*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) and *Pseudomonas aeruginosa*

Cefazolin: Enterobacterales (*Citrobacter koseri, Escherichia coli, Klebsiella oxytoca*, *Klebsiella pneumoniae* group, *Proteus mirabilis*)

Cefepime: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri*, *Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca*, *Klebsiella pneumoniae* group, *Proteus mirabilis, Proteus vulgaris*, *Serratia marcescens*) and *Pseudomonas aeruginosa*

Cefotaxime: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri*, *Enterobacter cloacae* complex, *Escherichia coli, Klebsiella oxytoca*, *Klebsiella pneumoniae* group, *Proteus mirabilis, Proteus vulgaris*, *Serratia marcescens*)

Cefoxitin: Enterobacterales (*Citrobacter koseri*, *Escherichia coli, Klebsiella oxytoca*, *Klebsiella pneumoniae* group, *Proteus mirabilis)*

Ceftazidime: *Acinetobacter* spp. (*Acinetobacter baumannii* complex), Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri*, *Enterobacter cloacae complex, Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae group, Morganella morganii*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescen*s)

Ceftazidime-avibactam: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli*, *Klebsiella aerogenes*, *Klebsiella oxytoca, Klebsiella pneumonae* group*, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) and *Pseudomonas aeruginosa*

Ceftolozane-tazobactam: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli*, *Klebsiella oxytoca, Klebsiella pneumonae* group*, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) and *Pseudomonas aeruginosa*

Ceftriaxone: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli*, *Klebsiella aerogenes*, *Klebsiella oxytoca, Klebsiella pneumonae* group*, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Cefuroxime: Enterobacterales (*Citrobacter koseri, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae* group*, Proteus mirabilis*)

Ciprofloxacin: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri*, *Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) and *Pseudomonas aeruginosa*

Ertapenem: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli*, *Klebsiella oxytoca, Klebsiella pneumonae* group*, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Gentamicin: Enterobacterales (*Citrobacter freundix* complex, *Citrobacter koseri, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Levofloxacin: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) and *Pseudomonas aeruginosa*

Meropenem: *Acinetobacter* spp. (*Acinetobacter baumannii* complex), Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex*, Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group*, Morganella*

morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens), and *Pseudmonas aeruginosa*

Meropenem-vaborbactam: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Piperacillin-tazobactam: *Acinetobacter* spp. (*Acinetobacter baumannii* complex) and Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Escherichia coli, Klebsiella aerogenes, Klebsiella pneumoniae* group, *Morganella morganii*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescens*)

Tigecycline: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Serratia marcescens*)

Tobramycin: Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Proteus mirabilis, Proteus vulgaris*) and *Pseudomonas aeruginosa*

Trimethoprim-sulfamethoxazole: Enterobacterales (*Citrobacter freundii* complex*, Citrobacter koseri*, *Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii, Proteus vulgaris*)

C Special Conditions for Use Statement(s):

Rx - For Prescription Use Only

General Limitations

- The ASTar BC G- kit can only be used with the ASTar Instrument.
- The ASTar BC G- kit has not been evaluated for specimens other than positive blood culture.
- The performance of the ASTar BC G- kit has only been evaluated using the following blood culture bottles:
  - bioMérieux BACT/ALERT FA Plus Aerobic
  - bioMérieux BACT/ALERT FN Plus Anaerobic
  - bioMérieux BACT/ALERT PF Plus
  - bioMérieux BACT/ALERT SN Standard Anaerobic
  - bioMérieux BACT/ALERT SA Standard Aerobic
  - BD BACTEC Peds Plus
  - BD BACTEC Lytic Anaerobic
  - BD BACTEC Plus Anaerobic
  - BD BACTEC Plus Aerobic
  - BD BACTEC Standard Aerobic
  - BD BACTEC Standard Anaerobic
- The ASTar BC G− Kit should not be used with blood culture bottles containing charcoal.
- Positive blood cultures should be tested immediately after a positive flag, where possible. A

16-hour sample stability claim is included in case of instrument errors or if re-testing is needed.
- Failure to observe proper procedures for sample collection, preparation, storage, handling and/or transportation may cause incorrect results.
- AST results should not be reported if two or more species are identified in a patient sample.
- If an AST result is not provided by the ASTar BC G- Kit, susceptibility testing must be performed using an alternate method.
- Subculturing of positive blood culture is necessary for organisms not claimed by the ASTar BC G- Kit and for antimicrobial agents not included on the ASTar panel.

Antimicrobial Susceptibility Testing (AST) Limitations

The following limitations were added to the device labeling based on performance demonstrated in the current submission:

- Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):
    - **Cefepime:** *Morganella morganii*
    - **Cefotaxime:** *Acinetobacter baumannii* complex, *Escherichia coli* when the ASTar MIC is 1 µg/mL due to one very major discrepancy, *Klebsiella aerogenes*, *Morganella morganii*
    - **Cefoxitin:** *Klebsiella oxytoca* when the ASTar MIC is 4 µg/mL due to one very major discrepancy, *Morganella morganii*, *Proteus vulgaris*
    - **Ceftazidime:** *Morganella morganii* when the ASTar MIC is 64 µg/mL due to one major discrepancy*, Pseudomonas aeruginosa*
    - **Ceftolozane-tazobactam:** *Klebsiella aerogenes, Morganella morganii*
    - **Ceftriaxone:** *Proteus vulgaris* when the ASTar MIC is 4 µg/mL due to one very major discrepancy, *Morganella morganii*
    - **Cefuroxime:** *Enterobacter cloacae* complex, *Klebsiella aerogenes*
    - **Ertapenem:** *Klebsiella aerogenes*, *Klebsiella pneumoniae* group when the ASTar MIC is 0.5 µg/mL due to one very major discrepancy, *Morganella morganii*
    - **Gentamicin:** *Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes*, *Klebsiella pneumoniae* group when the ASTar MIC is 2 µg/mL due to one very major discrepancy
    - **Meropenem:** *Escherichia coli* when the ASTar MIC is either 0.5 or 1 µg/mL due to three very major discrepancies, *Enterobacter cloacae* complex when the ASTar MIC is 0.5 µg/mL or 1 µg/mL due to two very major discrepancies
    - **Piperacillin-tazobactam:** *Enterobacter cloacae* complex*, Klebsiella oxytoca, Pseudomonas aeruginosa*
    - **Tobramycin:** *Enterobacter cloacae* complex when the ASTar MIC is 8 µg/mL due to one major discrepancy, *Klebsiella oxytoca* when the ASTar MIC is 32 µg/mL due to one major discrepancy, *Morganella morganii, Serratia marcescens*
    - **Trimethoprim-sulfamethoxazole:** *Proteus mirabilis, Serratia marcescens*

- Perform an alternate method of testing prior to reporting results when a resistant result is obtained for the following organisms, if critical to patient care:
    - **Trimethoprim-sulfamethoxazole:** *Klebsiella pneumoniae* group

- The ability of the ASTar system to detect resistance in the following antimicrobial/organism combinations is unknown because of an insufficient number of resistant isolates were available during the clinical study:
    - **Amikacin:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Klebsiella aerogenes, Klebsiella oxytoca, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Ampicillin-sulbactam:** *Citrobacter koseri, Klebsiella oxytoca, Proteus mirabilis, Proteus vulgaris*
    - **Aztreonam:** *Citrobacter freundii* complex*, Citrobacter koseri, Klebsiella aerogenes, Klebsiella oxytoca, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Cefepime:** *Citrobacter freundii* complex*, Klebsiella aerogenes, Klebsiella oxytoca, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Cefotaxime:** *Citrobacter freundii* complex, *Proteus vulgaris*
    - **Ceftazidime:** *Citrobacter freundii* complex, *Klebsiella oxytoca, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Ceftazidime-avibactam:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Klebsiella aerogenes, Klebsiella oxytoca, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Serratia marcescens*
    - **Ceftolozane-tazobactam:** *Citrobacter freundii* complex*, Proteus vulgaris, Serratia marcescens*
    - **Ceftriaxone:** *Citrobacter freundii* complex, *Proteus vulgaris*
    - **Cefuroxime:** *Klebsiella oxytoca, Proteus mirabilis*
    - **Ciprofloxacin:** *Citrobacter freundii complex, Citrobacter koseri, Enterobacter cloacae* complex, *Klebsiella aerogenes*, *Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aeruginosa*, *Serratia marcescens*
    - **Ertapenem:** *Citrobacter freundii* complex, *Proteus mirabilis, Proteus vulgaris*
    - **Gentamicin:** *Citrobacter freundii* complex*, Citrobacter koseri, Klebsiella oxytoca, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Levofloxacin:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Klebsiella aerogenes, Klebsiella oxytoca, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Serratia marcescens*
    - **Meropenem:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Morganella morganii, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Serratia marcescens*
    - **Meropenem-vaborbactam:** *Citrobacter freundii* complex, *Citrobacter koseri, Enterobacter cloacae* complex, *Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group, *Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Piperacillin-tazobactam:** *Citrobacter freundii* complex, *Citrobacter koseri, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*
    - **Tigecycline:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae* group*, Serratia marcescens*
    - **Tobramycin:** *Citrobacter freundii* complex*, Citrobacter koseri, Enterobacter cloacae* complex*, Klebsiella aerogenes, Proteus mirabilis, Proteus vulgaris*

- **Trimethoprim-sulfamethoxazole**: *Citrobacter freundii* complex, *Citrobacter koseri, Klebsiella aerogenes, Klebsiella oxytoca, Proteus vulgaris, Serratia marcescens*

D Special Instrument Requirements:

Test with the following software or later version:
ASTar BC G- Kit Software version 2.1
ASTar Application Computer Image version 1.6
ASTar Instrument Computer Image version 1.8

IV Device/System Characteristics:

A Device Description:

ASTar System is a fully automated system for antimicrobial susceptibility testing (AST). It consists of the ASTar Instrument in combination with dedicated application kits. The ASTar BC G- Kit contains the ASTar BC G- Consumable kit (discs and cartridges), ASTar BC G- Frozen insert, and ASTar BC G- Kit software which must be installed on the instrument to process the kit. The frozen insert is a single-use plastic container with frozen reagents and is added to the cartridge prior to sample run. The system prepares an inoculum for AST and utilizes high-speed, time-lapse microscopy imaging of pathogens in broth microdilution to determine minimum inhibitory concentration (MIC) and qualitative susceptibility results for samples. Organism identification by an alternate method is required to be entered into the ASTar Instrument for AST results to be reported.

The ASTar instrument is designed to carry out sample preparation of up to six samples in parallel using a dedicated ASTar Cartridge consumable for each sample. In the subsequent AST culturing step, the instrument transfers the prepared sample into a second dedicated consumable, referred to as the ASTar Disc. Up to 12 discs can be incubated simultaneously in the system with samples at different stages of the processing procedure. New samples can be loaded in a random-access manner when there are available slots. The operator interacts with the instrument via the touchscreen display to run test samples.

ASTar BC G- Kit is used for in vitro determination of AST results for commonly isolated bacteria derived from positive blood culture samples confirmed by Gram stain to be Gramnegative bacteria. To start an analysis, approximately 1 mL of a positive blood culture is pipetted into the ASTar Cartridge by the operator and loaded into the system. The instrument purifies and quantifies the bacteria, and the bacterial concentration is adjusted to the appropriate inoculum concentration. The bacterial suspensions are transferred automatically to the ASTar Disc and antimicrobial susceptibility testing is performed based on a defined protocol. The system generates an MIC and further qualitative susceptibility results (i.e., S, I, R) for the tested antimicrobials, where applicable. The ASTar System with the ASTar BC G- Kit can determine the MIC of various antimicrobials when tested against specific organisms with FDA Susceptibility Testing Interpretive Criteria (STIC) breakpoints.

B Principle of Operation:

The ASTar BC G- kit, along with the ASTar Instrument, constitute a fully automated system for the in vitro determination of antimicrobial susceptibility of Gram-negative bacilli present in

positive blood culture bottles (BCBs). The instrument provides inoculum preparation for AST and utilizes high-speed, time-lapse microscopy imaging of pathogens in broth microdilution to determine minimum inhibitory concentration (MIC) and qualitative susceptibility results.

The consumable kit consists of a preparation cartridge and a disk with dried antimicrobials in 1:2 dilution series. Approximately 1 mL of a positive blood culture, confirmed Gram-negative by Gram stain, is pipetted into the ASTar Cartridge by the operator and loaded into the system. All other procedures are automated. Briefly, the ASTar purifies and quantifies the bacteria from the BCB. Resin particles are removed by filtration and human-derived cells are lysed by adding lysis buffer to the sample. Bacteria are separated from the lysate by filtering and captured on a filter membrane. The pathogens present in the aliquot are resuspended in culture medium. Bacterial concentration is determined by mixing an aliquot of bacterial suspension with staining medium (fluorescent dye). The stained aliquot is added to the disc and the concentration is determined by fluorescent imaging at one wavelength. Based on the concentration, the instrument creates aliquots at a pre-defined inoculum concentration (typically 5×10^5 CFU/mL). The disc is placed in an incubator carousel and each well is imaged at specified time intervals using a high-speed optical microscopy system. Bacterial growth and response to relevant concentrations of different antimicrobial drugs are measured throughout the incubation period using the optical detection system in combination with image analysis algorithms. Next, the images are analyzed for bacterial content over time, and the system generates the MIC and qualitative susceptibility results (i.e., S, I, R) for the tested antimicrobials, where applicable. The qualitative results are determined based on established breakpoints. The system allows culturing and analysis to start in the absence of bacterial ID, which is only needed for final interpretation and reporting. Results are available within approximately 6 hours.

V Substantial Equivalence Information:

A Predicate Device Name(s):

ASTar BC G- Kit and ASTar Instrument

B Predicate 510(k) Number(s):

K221688

C Comparison with Predicate(s):

Device & Predicate Device(s):	K253573 (Device)	K221688 (Predicate)
Device Trade Name	ASTar BC G− Kit	ASTar BC G− Kit and ASTar Instrument
General Device Characteristic Similarities		
Intended Use	The ASTar System is intended to be used for the automated quantitative susceptibility testing for most clinically significant microorganisms. The ASTar System	Same

Device & Predicate Device(s):	K253573 (Device)	K221688 (Predicate)
	does not provide organism identification. The ASTAar System, comprised of the ASTar Instrument with the ASTar BC G− Kit (ASTar BC G− Consumable kit, ASTar BC G− Frozen Insert, and ASTar BC G− Kit software), utilizes high-speed, time-lapse microscopy imaging of bacteria for the *in vitro*, quantitative determination of antimicrobial susceptibility of on-panel gram-negative bacteria. The test is performed directly on positive blood culture samples signaled as positive by a continuous monitoring blood culture system and confirmed to contain gram- negative bacilli by Gram stain. Organism identification is required for AST result interpretation and reporting. Test results from the ASTar BC G− Kit should be interpreted in conjunction with other clinical and laboratory findings. Standard laboratory protocols for processing positive blood cultures should be followed to ensure availability of isolates for supplemental testing. Sub-culturing is necessary to support further testing for: bacteria and antimicrobials not on the ASTar BC G− panel, where inconclusive results are obtained, epidemiologic testing, recovery of organisms present in microbial samples, and susceptibility testing of bacteria in polymicrobial samples.	
Blood Culture Bottle Types	BD BACTEC: Standard Aerobic, Anaerobic; Lytic Anaerobic; Peds Plus, Plus Aerobic, Anaerobic BioMeriuex BacT/ALERT: Standard Aerobic, Anaerobic; Plus Aerobic,	Same

Device & Predicate Device(s):	K253573 (Device)	K221688 (Predicate)
	Anaerobic; PF Plus	
Technology	High-speed, time-lapse microscopy imaging	Same
Sample Type	Positive blood culture	Same
Sample Prep	Direct from sample. No manual McFarland preparation required	Same
Inoculation Method	Automated	Same
Read Method	Automated	Same
IVD Function	Provides AST results only. ID is required but provided by alternative method	Same
Instrument Platform	ASTar Instrument	Same
General Device Characteristic Differences		
Antimicrobial Panel	Amikacin Ampicillin Ampicillin-sulbactam Aztreonam Cefazolin Cefepime Cefotaxime Cefoxitin Ceftazidime Ceftazidime-avibactam Ceftolozane-tazobactam Ceftriaxone Cefuroxime Ciprofloxacin Ertapenem Gentamicin Levofloxacin Meropenem Meropenem-vaborbactam Piperacillin-tazobactam Tigecycline Tobramycin Trimethoprim-sulfamethoxazole	Amikacin Ampicillin Ampicillin-sulbactam Aztreonam Cefazolin Cefepime Ceftazidime Ceftazidime-avibactam Cefuroxime Ciprofloxacin Gentamicin Levofloxacin Meropenem Meropenem-vaborbactam Piperacillin-tazobactam Tigecycline Tobramycin Trimethoprim-sulfamethoxazole
Tested Organisms	*Acinetobacter* spp. *(Acinetobacter baumannii* complex) Enterobacterales (*Citrobacter freundii* complex, *Citrobacter koseri, Escherichia coli, Enterobacter cloacae* complex, *Klebsiella aerogenes, Klebsiella oxytoca,*	*Acinetobacter baumannii* *Citrobacter freundii*, *Citrobacter koseri, Escherichia coli, Enterobacter cloacae* complex, *Klebsiella aerogenes, Klebsiella*

Device & Predicate Device(s):	K253573 (Device)	K221688 (Predicate)
	Klebsiella pneumoniae group, *Morganella morganii, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*) *Pseudomonas aeruginosa*	*oxytoca, Klebsiella pneumoniae*, *Proteus mirabilis, Proteus vulgaris, Serratia marcescens* *Pseudomonas aeruginosa*

Predetermined Change Control Plan (PCCP):
To support the implementation of changes to FDA-recognized susceptibility test interpretive criteria (i.e., breakpoints), this submission included a breakpoint change protocol that was reviewed and accepted by FDA. This protocol addresses future revisions to device labeling in response to breakpoint changes that are recognized on the FDA STIC webpage (https://www.fda.gov/Drugs/DevelopmentApprovalProcess/DevelopmentResources/ucm410971.htm). The protocol outlined the specific procedures and acceptance criteria that Q-linea AB intends to use to evaluate the ASTar system with the ASTar BC G- Kit when revised breakpoints for indicated drugs are published on the FDA STIC webpage. The breakpoint change protocol included with the submission indicated that if specific criteria are met, Q-linea AB will update the ASTar BC GN- Kit label to include (1) the new breakpoints, (2) an updated performance section after re-evaluation of data in this premarket notification with the new breakpoints, and (3) any new limitations as determined by their evaluation.

VI Standards/Guidance Documents Referenced:

- FDA Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems; Guidance for Industry and FDA (Issued August 28, 2009)
- CLSI M07, 12th Ed., 2024 Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically
- CLSI M100, 36th Ed., 2026 Performance Standards for Antimicrobial Susceptibility Testing
- AAMI TIR57:2016 (R2023) Principles for medical device security- Risk management
- CLSI AUTO11-A2, 2nd Ed., 2024 Information Technology Security of In Vitro Diagnostic Instruments and Software Systems
- CLSI EP07, 33rd Ed., 2021 Performance Standards for Antimicrobial Susceptibility Testing, R2022 Interference Testing in Clinical Chemistry
- CLSI EP25-A (Replaces EP25-P), 2023 Evaluation of Stability of In Vitro Diagnostic Reagents
- IEC 62304 Edition 1.1 2015-06 Consolidated Version, Medical device software - Software life cycle processes
- IEC 62366-1 Edition 1.1 2020-06 Consolidated Version, Medical devices - Part 1: Application of usability engineering to medical devices
- IEC 81001-5-1 Edition 1.0 2021-12 Health software and health IT systems safety, effectiveness and security - Part 5-1: Security - Activities in the product life cycle
- ISO 14971 Third Edition 2019-12 Medical devices - Application of risk management to medical devices
- ISO 15223-1 Fourth edition 2021-07 Medical devices - Symbols to be used with information to be supplied by the manufacturer - Part 1: General requirements

- ISO 20417 First edition 2021-04 Corrected version 2021-12 Medical devices- Information to be supplied by the manufacturer

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

1. Precision/Reproducibility:
   A reproducibility study with the ASTar System (ASTar BC G− Kit run on ASTar Instrument) was conducted using contrived positive blood culture bottles prepared with 27 bacterial strains from *Acinetobacter* spp. Enterobacterales, and *Pseudomonas aeruginosa*. Triplicate samples from each contrived blood culture were tested at three sites on at least two days. Reproducibility was determined from the total number (and percent) of results that were within one dilution (+/- one doubling dilution) of the modal MIC result divided by the total number of results. All samples were tested within 16 hours of bottle positivity. Both best-case (assumes that off-scale results are within one dilution of the mode) and worst-case (assumes that off-scale results are more than one dilution of the mode) performance was determined for each antimicrobial. Antimicrobials with an inter-site worst-case reproducibility of <89% or where an insufficient number of results were generated in the initial study were further evaluated in supplemental studies in which testing was conducted at one internal site with three individual instruments to increase the number of on-scale valid results. In general, testing was performed similar to the reproducibility study protocol used to support the original clearance of the ASTar System, as described in K221688. Overall, inter-site and intra-site reproducibility were >95% and determined to be acceptable. Reproducibility results for antimicrobials added to the ASTar BC G- Kit in the current submission are listed in **Table 1**.

Table 1. Reproducibility of Antimicrobials Added to the ASTar BC G- Kit

Drug	Overall Best-case	Overall Worst-case
Cefotaxime	143/144 (99.3%)	136/144 (94.4%)
Cefoxitin	213/215 (99.1%)	206/215 (95.8%)
Ceftolozane-tazobactam	144/144 (100%)	143/144 (99.3%)
Ceftriaxone	125/125 (100%)	116/125 (92.8%)
Ertapenem	160/160 (100%)	158/160 (98.8%)

2. Linearity:

   Not Applicable

3. Analytical Specificity/Interference:

   Analytical Specificity

   Not Applicable

Interference Studies

The potential impact of interfering substances on the results of the ASTar BC G- Kit with the ASTar system was previously assessed in K221688. Interference studies for the five new antimicrobials (cefotaxime, cefoxitin, ceftolozane-tazobactam, ceftriaxone, and ertapenem) added to the ASTar BC G- Kit in this submission were also performed following the study design described in the K221688 Decision Summary with the same interfering substances. Overall, the presence of high concentrations of the tested interferents in blood cultures does not interfere with the results of the new antimicrobials added to the ASTar BC G- Kit with the ASTar System.

4. Detection Limit and Assay Reportable Range:

   Not Applicable

5. Traceability, Stability, Expected Values (Controls, Calibrators, or Methods):

   Quality Control Testing. Quality control samples were run each day that testing was conducted. CLSI recommended QC strains for each antimicrobial were tested a sufficient number of times (i.e., at least 20 times/site) at each testing site using the ASTar System, including the reference site using the broth microdilution reference method. QC organisms were tested on a rotating basis. QC expected ranges and results for the ASTar System are summarized in **Table 2**. For all antimicrobials, greater than 95% of results were within the expected range, which is acceptable.

Table 2. QC Expected Ranges and Results for the Quantitative ASTar System

Antimicrobial	ASTar QC Reportable Range (µg/mL)	QC Organism	CLSI Expected Range (µg/mL)	Number in Range (%)	
				ASTar	Reference
Amikacin	≤0.125 to ≥256	*E. coli* ATCC 25922	0.5-4	63/63 (100%)	46/46 (100%)
Ampicillin-sulbactam	≤1 to ≥128	*E. coli* ATCC 25922	2/1–8/4	61/63 (96.8%)	41/41 (100%)
		K. pneumoniae ATCC 700603	8/4–32/16	60/60 (100%)	41/41 (100%)
Aztreonam	≤0.125 to ≥128	*P. aeruginosa* ATCC 27853	2-8	60/61 (98.4%)	41/41 (100%)
Cefazolin	≤0.125 to ≥32	*E. coli* ATCC 25922	1-4	63/63 (100%)	46/46 (100%)
Cefepime	≤0.125 to ≥128	*P. aeruginosa* ATCC 27853	0.5-4	61/61 (100%)	41/41 (100%)
Cefotaxime	≤0.008 to ≥256	*E. coli* ATCC 25922	0.03-0.12	61/63 (96.8%)	47/47 (100%)
Cefoxitin	≤0.5 to ≥128	*E. coli* ATCC 25922	2-8	63/63 (100%)	46/46 (100%)
Ceftazidime	≤0.25 to ≥128	*K. pneumoniae* ATCC 700603[a]	16-64	60/60 (100%)	46/47 (97.9%)
	≤0.125 to ≥128	*P. aeruginosa* ATCC 27853	1-4	60/61 (98.4%)	45/47 (95.7%)
Ceftazidime-avibactam	≤0.06 to ≥64	*K. pneumoniae* ATCC 700603	0.25/4–2/4	60/60 (100%)	46/47 (97.9%)

Antimicrobial	ASTar QC Reportable Range (µg/mL)	QC Organism	CLSI Expected Range (µg/mL)	Number in Range (%)	
				ASTar	Reference
		P. aeruginosa ATCC 27853	0.5/4–4/4	60/60 (100%)	47/47 (100%)
Ceftolozane-tazobactam	≤0.06 to ≥64	*K. pneumoniae* ATCC 700603	0.5/4–2/4	60/60 (100%)	46/47 (97.9%)
		P. aeruginosa ATCC 27853	0.25/4–1/4	60/61 (98.4%)	47/47 (100%)
Ceftriaxone	≤0.008 to ≥256	*E. coli* ATCC 25922	0.03-0.12	61/63 (96.8%)	44/47 (93.6%)
Cefuroxime	≤0.5 to ≥128	*E. coli* ATCC 25922	2-8	62/63 (98.4%)	47/47 (100%)
Ciprofloxacin	≤0.06 to ≥16	*P. aeruginosa* ATCC 27853	0.12-1	61/61 (100%)	46/46 (100%)
Ertapenem	≤0.03 to ≥32	*P. aeruginosa* ATCC 27853	2-8	60/60 (100%)	42/46 (91.3%)
Gentamicin	≤0.25 to ≥64	*P. aeruginosa* ATCC 27853	0.5-2	61/61 (100%)	46/46 (100%)
Levofloxacin	≤0.125 to ≥32	*P. aeruginosa* ATCC 27853	0.5-4	61/61 (100%)	46/47 (97.9%)
Meropenem	≤0.03 to ≥128	*P. aeruginosa* ATCC 27853	0.12-1	61/61 (100%)	40/40 (100%)
Meropenem-vaborbactam	≤0.06 to ≥64	*K. pneumoniae* ATCC BAA-2814	0.12/8– 0.5/8	60/60 (100%)	40/41 (97.6%)
		P. aeruginosa ATCC 27853	0.12/8–1/8	60/61 (98.4%)	41/41 (100%)
Piperacillin-tazobactam	≤0.25 to ≥512	*K. pneumoniae* ATCC 700603	8/4–32/4	60/60 (100%)	46/47 (97.9)
	≤0.125 to ≥512	*P. aeruginosa* ATCC 27853	1/4–8/4	61/61 (100%)	46/47 (97.9)
Tobramycin	≤0.06 to ≥64	*E. coli* ATCC 25922	0.25-1	63/63 (100%)	46/46 (100%)
Trimethoprim-sulfamethoxazole	≤0.03 to ≥16	*E. coli* ATCC 25922	≤ 0.5/9.5	61/61 (100%)	47/47 (100%)

Purity Check. A purity check was performed on each positive blood culture sample to verify that only monomicrobial samples were included in the studies.

Growth Failure Rate. The growth failure rate for clinical samples with the ASTar system during the study was 4.1%.

Microbial Suspension Accuracy Study

The microbial suspension accuracy of the ASTar System was previously assessed in K221688. Refer to the K221688 Decision Summary for additional details.

Sample Stability Study

The sample stability of the ASTar BC G- Kit with the ASTar system was previously assessed in K221688. Sample stability studies for the five new antimicrobials (cefotaxime, cefoxitin, ceftolozane-tazobactam, ceftriaxone, and ertapenem) added to the ASTar BC G- Kit in this

submission were also performed following the study design described in the K221688 Decision Summary. Overall, results for the new antimicrobials were acceptable for stability up to 16 hours (stored at both room temperature (RT) and at 35°C), consistent with the previous stability claims in K221688.

As noted in the instructions for use, all blood culture bottle samples should be tested immediately after a positive flag on a continuous monitoring system. In the case of unavoidable delays or if the need for re-testing arises, positive blood culture bottles may be tested up to 16 hours post ring.

6. Assay Cut-Off:

   Not Applicable

7. Carry-Over:

   The Carry-Over studies of the ASTar System was previously assessed in K221688. Refer to the K221688 Decision Summary for additional details.

B Comparison Studies:

1. Method Comparison with Predicate Device:

   Clinical performance testing with the ASTar System was performed at two external sites and one internal site. The broth microdilution reference method testing was performed at a single reference site. Performance was evaluated using fresh (prospective) positive blood cultures, as well as positive blood culture samples seeded with clinical stock isolates and challenge isolates. Organism identification was obtained from an FDA cleared molecular bacterial identification method and/or FDA cleared MALDI TOF method for input into the ASTar system. The species identification provided by the clinical site was confirmed at the reference site using an FDA-cleared MALDI identification method. For any samples with a species identification at the reference site not matching the expected ID or found to be polymicrobial, the sample was excluded from the final performance data according to the exclusion criteria.

   Performance testing of the ASTar system included five (5) new antimicrobials added to the ASTar BC G- Kit (cefotaxime, cefoxitin, ceftolozane-tazobactam, ceftriaxone, and ertapenem), as well as additional organisms tested with antimicrobials cleared in K221688. A total of 598 positive blood cultures (167 fresh (prospective), 221 seeded with clinical stock organisms, and 210 seeded with challenge organisms) with new antimicrobials were tested to evaluate the ASTar System performance. A total of 630 positive blood culture bottles (167 fresh (prospective), 221 seeded with clinical stock organisms, and 242 seeded with challenge organisms) with cleared antimicrobials were tested to evaluate the ASTar system performance. Additionally, clinical data for some antimicrobials cleared in K221688 were reanalyzed to evaluate performance of the ASTar system and ASTar BC G- Kit with updated FDA STIC breakpoints.

   ASTar system results were compared to results obtained with the CLSI broth microdilution (BMD) reference method. Reference BMD panels were run in triplicate for each isolate and an MIC mode was determined for comparison with the ASTar BC G- Kit MIC result. If an

MIC mode could not be established from the first three BMD results, a second set of BMD assays was run in triplicate and the MIC mode across all six tests was determined. If a mode still could not be established, the median MIC was used for comparison with the ASTar BC G- Kit MIC result.

Performance was determined generally based on criteria outlined in the Class II Special Controls Guidance Document: Antimicrobial Susceptibility Test (AST) Systems including essential agreement (EA), category agreement (CA), and categorical errors (minor, major and very major errors). EA was calculated as the percentage of ASTar MIC results that were within ± 1 serial two-fold dilution of the reference result. CA was calculated as the percentage of ASTar interpretive results (S/I/SDD/R) that were identical to the interpretive results of the reference result. EA of evaluable results (on-scale ASTar and reference results or results in which an off-scale result was at least two doubling dilutions from the on-scale result) were also calculated. Performance was considered acceptable if the EA and CA were ≥89.9%, major error rate was ≤3%, and very major error rate was ≤2%. For antimicrobials that lack an intermediate interpretive result, further analysis of the category errors was performed, and adjustments were made by considering the MIC values that were one doubling dilution from the reference MIC value. For antimicrobial/organism group combinations in this submission where the susceptible-dose dependent category is recognized in place of the intermediate category (S/I/SDD/R), any errors that were observed with this category were designated as minor errors.

A summary of the performance of the ASTar System is described below for each antimicrobial/organism combinations as follows, and the data is summarized in the corresponding indicted tables:

- **A.** ASTar Performance with New Antimicrobials (**Table 3**).
- **B.** Acceptable ASTar Performance of Additional Organisms with Previously Cleared Antimicrobials (**Table 4**) and Unacceptable ASTar Performance of Additional Organisms with Previously Cleared Antimicrobials (**Table 5**).
- **C.** Additional Testing to Remove Performance Limitations with Cleared Antimicrobials (**Table 6**).
- **D.** ASTar Performance of Antimicrobials with Updated Breakpoints (**Table 7**).

A. ASTar Performance with New Antimicrobials

Data for several of the antimicrobials included in this submission was previously submitted and reviewed in K221688. Claims were not granted due to unacceptable performance; refer to K221688 Decision Summary. In this submission, additional testing was performed to support the addition of these antimicrobials to the ASTar BC G- Kit. The performance data for these antimicrobial/organism combinations is provided in **Table 3**.

Cefotaxime/Enterobacterales. A total of 478 Enterobacterales (19 *C. freundii* complex, 22 *C. koseri*, 25. *E. cloacae* complex, 131 *E. coli*, 19 *K. aerogenes*, 54 *K. oxytoca*, 99 *K. pneumoniae* group, 26 *M. morganii*, 37 *P. mirabilis*, 15 *P. vulgaris*, and 31 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 95.6% and CA of 96.7%. There were eight (8) minor errors, seven (7) major errors

(7/321 = 2.1%), and one (1) very major error (1/150 = 0.7%). Overall performance is acceptable.

When evaluating by individual species, *E. coli* had one (1) very major error (1/34 = 2.9%), which is not acceptable. A limitation is included in the device labeling to address the unacceptable very major error rate by restricting reporting at an ASTar MIC of 1 µg/mL. *K. aerogenes* demonstrated an EA of 84.2%, which is not acceptable. Due to the unacceptable EA, this antimicrobial/organism combination is not indicated for use with the ASTar system. *M. morganii* demonstrated an EA of 69.2% and a CA of 73.1%, which is not acceptable. There were two (2) minor errors, five (5) major errors (5/18 = 27.8%), and no very major errors. Due to the unacceptable EA, CA, and major error rate of *M. morganii*, this antimicrobial/organism combination is not indicated for use with the ASTar system. The following limitation is included in the device labeling to address the very major error rate of *E. coli*, the unacceptable EA performance of *K. aerogenes*, and the unacceptable EA, CA, and major error rate of *M. morganii*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefotaxime: Escherichia coli when the ASTar MIC is 1 µg/mL due to one very major discrepancy, Klebsiella aerogenes, Morganella morganii*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex and *Proteus vulgaris* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefotaxime: Citrobacter freundii complex, Citrobacter koseri, Enterobacter cloacae complex, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae group, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*

Cefoxitin/Enterobacterales. A total of 375 Enterobacterales (22 *C. koseri*, 131 *E. coli*, 42 *K. oxytoca*, 99 *K. pneumoniae* group, 27 *M. morganii*, 37 *P. mirabilis*, and 17 *P. vulgaris*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 96.8% and CA of 89.1%. The <90% CA was considered acceptable since the majority of the categorical errors were minor and the EA of evaluable results was high. There were 38 minor errors, one (1) major error (1/248 = 0.4%), and two (2) very major errors (2/83 = 2.4%).

When evaluating by individual species, *E. coli* demonstrated an EA of 97.0% and a CA of 87.0%. There were 17 minor errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high. *K. oxytoca* had one (1) very major error (1/14 = 7.1%), which is not acceptable. A limitation is included in the device labeling to address the unacceptable very major error rate by restricting reporting at an ASTar MIC of 4 µg/mL. *M. morganii* demonstrated an EA of 96.3% and a CA of 63.0%, which is not acceptable. There were 10

minor errors, no major errors, and no very major errors. Due to the unacceptable CA of M. *morganii*, this antimicrobial/organism combination is not indicated for use with the ASTar System. *P. mirabilis* had one very major error (1/5 = 20%). This very major error is considered a random error due to the limited number of resistant isolates tested, and the performance is acceptable. *P. vulgaris* demonstrated an EA of 88.2% and a CA of 76.5%, which is not acceptable. There were three (3) minor errors, one (1) major error (1/13 = 7.7%), and no very major errors. Due to the unacceptable EA, CA, and major error rate of *P. vulgaris*, this antimicrobial/organism combination is not indicated for use with the ASTar System. The following limitation is included in the device labeling to address the very major error rate of *K. oxytoca* and the unacceptable EA, CA and major error rate of *P. vulgaris*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefoxitin: Klebsiella oxytoca when the ASTar MIC is 4 µg/mL due to one very major discrepancy, Morganella morganii, Proteus vulgaris*

Ceftolozane-tazobactam/Enterobacterales. A total of 473 Enterobacterales (19 *C. freundii* complex, 22 *C. koseri*, 25 *E. cloacae* complex, 131 *E. coli*, 21 *K. aerogenes*, 43 *K. oxytoca*, 98 *K. pneumoniae* group, 27 *M. morganii*, 37 *P. mirabilis*, 17 *P. vulgaris*, and 33 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 96.8% and CA of 97.3%. There were 11 minor errors, one (1) major error (1/390 = 0.3%), and one (1) very major error (1/78 = 1.3%). Overall performance is acceptable.

When evaluating by individual species, *K. aerogenes* demonstrated an EA of 90.5% and a CA of 81.0%, which is not acceptable. There were three (3) minor errors, no major errors, and one (1) very major error (1/3 = 33.3%). Due to the unacceptable CA and very major error rate of *K. aerogenes*, this antimicrobial/organism combination is not indicated for use with the ASTar System. *M. morganii* had one (1) major error (1/24 = 4.2%), which is not acceptable. Due to the unacceptable major error rate of M. *morganii*, this antimicrobial/organism combination is not indicated for use with the ASTar System. The following limitation is included in the device labeling to address the unacceptable CA and very major error rate of *K. aerogenes* and the unacceptable major error rate of *M. morganii*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ceftolozane-tazobactam: Klebsiella aerogenes, Morganella morganii*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex, *Proteus vulgaris,* and *Serratia marcescens* isolates.

Ceftolozane-tazobactam/*P. aeruginosa.* A total of 60 *P. aeruginosa* were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 93.3% and CA of 93.3%. There were four (4) minor errors, no major error, and no very major errors. Overall performance is acceptable.

Based on the performance described for both Enterobacterales and *P. aeruginosa* above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ceftolozane-tazobactam: Citrobacter freundii complex, Citrobacter koseri, Enterobacter cloacae complex, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae group, Proteus mirabilis, Proteus vulgaris, Serratia marcescens, Pseudomonas aeruginosa*

Ceftriaxone/Enterobacterales. A total of 480 Enterobacterales (19 *C. freundii* complex, 22 *C. koseri*, 24 *E. cloacae* complex, 131 *E. coli*, 20 *K. aerogenes*, 54 *K. oxytoca*, 98 *K. pneumoniae* group, 26 *M. morganii*, 37 *P. mirabilis*, 16 *P. vulgaris*, and 33 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 97.1% and CA of 98.3%. There were five (5) minor errors, three (3) major error (3/326 = 0.9%), and no very major errors. Overall performance is acceptable.

When evaluating by individual species, *M. morganii* demonstrated an EA of 80.8% a CA of 84.6%, which is not acceptable. There were three (3) minor errors, one (1) major error (1/18 = 5.6%), and no very major errors. Due to the unacceptable EA, CA, and major error rate of M. *morganii*, this antimicrobial/organism combination is not indicated for use with the ASTar System. *P. vulgaris* had one (1) major error (1/15 = 6.7%), which is not acceptable. A limitation is included in the device labeling to address the unacceptable very major error rate by restricting reporting at an ASTar MIC of 4 µg/mL. The following limitation is included in the device labeling to address the unacceptable EA, CA and major error rate of *M. morganii* and the unacceptable major error rate of *P. vulgaris*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ceftriaxone: Proteus vulgaris when the ASTar MIC is 4 µg/mL due to one very major discrepancy, Morganella morganii*

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ceftriaxone: Citrobacter freundii complex, Citrobacter koseri, Enterobacter cloacae complex, Escherichia coli, Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae group, Proteus mirabilis, Serratia marcescens*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex and *Proteus vulgaris* isolates.

Ertapenem/Enterobacterales. A total of 477 Enterobacterales (19 *C. freundii* complex, 22 *C. koseri*, 25 *E. cloacae* complex, 131 *E. coli*, 21 *K. aerogenes*, 43 *K. oxytoca*, 99 *K. pneumoniae* group, 27 *M. morganii*, 40 *P. mirabilis*, 17 *P. vulgaris*, and 33 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 95.2% and CA of 97.9%. There were six (6) minor errors, two (2) major error (2/393 = 0.5%), and two (2) very major errors (2/6 = 33.3%).

When evaluating by individual species, *K. aerogenes* demonstrated an EA of 81.0%, a CA of 81%, which is not acceptable. There were four (4) minor errors, no major errors, and no major errors. Due to the unacceptable EA and CA of *K. aerogenes*, this antimicrobial/organism combination is not indicated for use with the ASTar System. *K. pneumoniae* group had one (1) very major error (1/36 = 2.8%), which is not acceptable. A limitation is included in the device labeling to address the unacceptable very major error rate by restricting reporting at an ASTar MIC of 0.5 µg/mL. *M. morganii* demonstrated an EA of 88.9% and had one (1) major error (1/25 = 4.0%), which is not acceptable. Due to do the unacceptable EA and major error rate of *M. morganii*, this antimicrobial/organism combination is not indicated for use with the ASTar System. *P. mirabilis* had one (1) very major error (1/1 = 100%). This very major error is considered a random error due to the limited number of resistant isolates tested, and the performance is acceptable. The following limitation is included in the device labeling to address the unacceptable EA and CA of *K. aerogenes*, the very major error rate of *K. pneumoniae* group, the unacceptable EA and major error rate of *M. morganii*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ertapenem: Klebsiella aerogenes, Klebsiella pneumoniae group when the ASTar MIC is 0.5 µg/mL due to one very major discrepancy, Morganella morganii*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex, *Proteus mirabilis, Proteus vulgaris,* and *Proteus vulgaris* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ertapenem: Citrobacter freundii complex, Citrobacter koseri, Enterobacter cloacae complex, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae group, Proteus mirabilis, Proteus vulgaris, Serratia marcescens*

Table 3. ASTar Performance with New Antimicrobials

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Cefotaxime: Enterobacterales [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	157	152	96.8	14	9	64.3	154	98.1	39	116	3	0	0
Fresh	153	148	96.7	8	3	37.5	150	98.0	36	117	0	2	1
Seeded Clinical	168	157	93.5	30	19	63.3	158	94.1	75	88	5	5	0
Combined	478	457	95.6	52	31	59.6	462	96.7	150	321	8	7	1
Cefoxitin: Enterobacterales [≤4 (S),8 (I), ≥16 (R)]													
Challenge	87	87	100	64	64	100	84	96.6	27	56	3	0	0
Fresh	141	133	94.3	126	118	93.7	120	85.1	11	122	20	1	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Seeded Clinical	147	143	97.3	118	114	96.6	130	88.4	45	70	15	0	2
Combined	375	363	96.8	308	296	96.1	334	89.1	83	248	38	1	2
Ceftolozane-tazobactam: Enterobacterales [≤2/4 (S), 4/4 (I), ≥8/4 (R)]													
Challenge	149	147	98.7	33	31	93.9	145	97.3	31	116	1	0	0
Fresh	153	149	97.4	19	15	79.0	151	98.7	5	147	1	0	1
Seeded Clinical	171	162	97.4	61	52	85.3	164	95.9	42	127	6	1	0
Combined	473	458	96.8	113	98	86.7	460	97.3	78	390	11	1	1
Ceftolozane-tazobactam: *Pseudomonas aeruginosa* [≤4/4 (S), 8/4 (I), ≥16/4 (R)]													
Challenge	24	23	95.8	20	19	95.0	24	100	3	21	0	0	0
Fresh	12	12	100	12	12	100	12	100	0	12	0	0	0
Seeded Clinical	24	21	87.5	24	21	87.5	20	83.3	1	19	4	0	0
Combined	60	56	93.3	56	52	92.9	56	93.3	4	52	4	0	0
Ceftriaxone: Enterobacterales [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	158	156	98.7	10	8	80.0	157	99.4	40	118	1	0	0
Fresh	152	148	97.4	8	4	50.0	150	98.7	34	117	1	1	0
Seeded Clinical	170	162	95.3	22	14	63.6	165	97.1	71	91	3	2	0
Combined	480	466	97.1	40	26	65.0	472	98.3	145	326	5	3	0
Ertapenem: Enterobacterales [≤0.5 (S), 1 (I), ≥2 (R)]													
Challenge	152	146	96.1	20	14	70.0	148	97.4	31	116	4	0	0
Fresh	153	149	97.4	10	6	60.0	151	98.7	4	147	2	0	0
Seeded Clinical	172	159	92.4	32	19	59.4	168	97.7	38	133	0	2	2
Combined	477	454	95.2	62	39	62.9	467	97.9	73	396	6	2	2

EA – Essential Agreement
CA – Category Agreement
R – Resistant
S – Susceptible

Eval – Evaluable MIC Results
min – Minor Discrepancies
maj – Major Discrepancies
vmj – Very Major Discrepancies

Essential Agreement (EA) occurs when there is agreement between the reference method and ASTar MIC results within plus or minus one serial two-fold dilution of the antibiotic. Evaluable results are those that are on-scale for both the ASTar and the reference method or those in which an off-scale result is at least two doubling dilutions from the on-scale result. Category Agreement (CA) occurs when the interpretation of the reference method and ASTar result are in exact agreement.

B. Acceptable ASTar Performance of Additional Organisms with Previously Cleared Antimicrobials

For some antimicrobials originally cleared in K221688, performance of additional organisms was evaluated. Antimicrobial/organism combinations for which performance was acceptable are provided in **Table 4** and antimicrobial/organism combinations for which performance was unacceptable are provided in **Table 5**.

Amikacin
A total of 50 *A. baumannii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.0% and CA of 98.0%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 95.5% and CA of 95.5%. There was one (1) minor error and no major or very major errors. Performance is acceptable.

A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 98.5% and CA of 99.2%. There was one (1) minor error and no major or very major errors. Performance is acceptable.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.3% and CA of 96.3%. There was one (1) minor error and no major or very major errors. Performance is acceptable.

A total of 16 *P. vulgaris* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and very major errors. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobcter koseri*, *Morganella morganii,* and *Proteus vulgaris* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Amikacin: Acinetobacter baumannii complex, Escherichia coli, Proteus vulgaris*

Ampicillin-sulbactam
A total of 50 *A. baumannii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.0% and CA of 90.0%. There were five (5) minor errors, no major errors, and no very major errors. Performance is acceptable

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.3% and CA of 85.2%. There were four (4) minor errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high. Performance is acceptable.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ampicillin-sulbactam: Acinetobacter baumannii complex*

Aztreonam

A total of 19 *C. freundii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 26 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.2% and CA of 96.2%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 83 *P. aeruginosa* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 91.7% and CA of 81.9%. There were fifteen (15) minor errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobcter freundii* complex isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Aztreonam: Citrobacter freundii complex, Pseudomonas aeruginosa*

Cefazolin

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 95.5%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.7% and CA of 93.1%. There were nine (9) minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 43 *K. oxytoca* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.7% and CA of 88.4%. There were four (4) minor errors, one (1) major error (1/5 = 20%), and no very major errors. The <90% CA was considered acceptable since the majority of the categorical errors were minor and the EA of evaluable results was high. The major error is considered a random error due to the limited number of susceptible isolates tested. Performance is acceptable.

A total of 37 *P. mirabilis* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.3% and CA of 86.5%. There were five (5) minor

errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high. Performance is acceptable.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefazolin: Citrobacter koseri, Escherichia coli, Kelbsiella oxytoca, Proteus mirabilis*

Cefepime

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 95.5% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 25 *E. cloacae* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 92.0% and CA of 96.0%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 88.9% and CA of 92.6%. There were no minor errors, one (1) major error (1/24 = 4.2%), and one (1) very major error (1/3 = 33.3%). Due to the unacceptable EA, major error rate, and very major error rate of *M. morganii*, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefepime: Morganella morganii*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Proteus vulgaris* isolates.

Based on the performance described above, the following limitations were removed from device labeling:

The ability of the ASTar system to detect resistance in the following antimicrobial/ organism combinations is unknown because of an insufficient number of resistant isolates were available during the clinical study:

- *Cefepime: Citrobacter koseri*

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefepime: Enterobacter cloacae complex*

Ceftazidime
A total of 50 *A. baumannii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 98.0% and CA of 92.0%. There were four (4) minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 19 *C. freundii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.5% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 26 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.2% and CA of 92.3%. There was one (1) minor error, one (1) major error (1/18 = 5.6%), and no very major errors. The following limitation is included in the device labeling to address the unacceptable major error rate:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):
- *Ceftazidime: Morganella morganii when the ASTar MIC is 64 µg/mL due to one major discrepancy*

A total of 60 *P. aeruginosa* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.0% and CA of 95.0%. There were two (2) minor errors, no major errors, and one (1) very major error (1/14 = 7.1%). Due to the unacceptable very major error rate, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):
- *Ceftazidime: Pseudomonas aeruginosa*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):
- *Ceftazidime: Acinetobacter baumannii complex, Citrobacter freundii complex, Citrobacter koseri, Klebsiella aerogenes*

Ceftazidime-avibactam
A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 98.5% and CA of 99.2%. There were no minor errors, one (1) major error (1/125 = 0.8%), and no very major errors. Due to the lack of an intermediate breakpoint, further analysis of the errors was performed, and adjustments were made by considering the MIC values of the errors compared to the reference MIC values. The one major error is not in essential agreement with the reference MIC values; and the adjusted major error rate is 0.8% (1/125). Performance is acceptable.

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 97 *K. pneumoniae* group were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.9% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 17 *P. vulgaris* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Klebsiella aerogenes, Morganella morganii,* and *Proteus vulgaris* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ceftazidime-avibactam: Escherichia coli, Klebsiella aerogenes, Klebsiella pneumoniae group*

Cefuroxime
A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 95.5% and CA of 95.5%. There were no minor errors, no major errors, and one (1) very major error (1/8 = 12.5%). Due to the lack of an intermediate breakpoint, further analysis of the errors was performed, and adjustments were made by considering the MIC values of the errors compared to the reference MIC values. The one very major error is in essential agreement with the reference MIC values. Therefore, the very major error rate was adjusted to 0% (0/8). Performance is acceptable.

A total of 25 *E. cloacae* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 92.0% and CA of 88.0%, which is not acceptable. There were no minor errors, no major errors, and three (3) very major errors

(3/14 = 21.4%). Due to the lack of an intermediate breakpoint, further analysis of the errors was performed, and adjustments were made by considering the MIC values of the errors compared to the reference MIC values. Two of the three very major errors were in essential agreement with the reference MIC values. Therefore, the very major error rate was adjusted to 7.1% (1/14), which is still not acceptable. Due to the unacceptable CA and very major error rate of *E. cloacae* complex, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 20 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 80.0% and CA of 85.0%, which is not acceptable. There were no minor errors, no major errors, and three (3) very major errors (3/9 = 33.3%). Due to the lack of an intermediate breakpoint, further analysis of the errors was performed, and adjustments were made by considering the MIC values of the errors compared to the reference MIC values. One of the three very major errors was in essential agreement with the reference MIC values. Therefore, the very major error rate was adjusted to 22.2% (2/9), which is still not acceptable. Due to the unacceptable EA, CA, and very major error rate of *K. aerogenes*, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefuroxime: Enterobacter cloacae complex, Klebsiella aerogenes*

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefuroxime: Citrobacter koseri*

Ciprofloxacin

A total of 19 *C. freundii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Ciprofloxacin: Citrobacter freundii complex*

Gentamicin
A total of 25 *E. cloacae* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 72.0% and CA of 96.0%, which is not acceptable. There was one (1) minor error, no major errors, and no very major errors. Due to the unacceptable EA, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 87.8% and CA of 99.2%, which is not acceptable. There was one (1) minor error, no major errors, and no very major errors. Due to the unacceptable EA, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 85.7% and CA of 100%, which is not acceptable. There were no minor errors, no major errors, and no very major errors. Due to the unacceptable EA, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Gentamicin: Enterobacter cloacae complex, Escherichia coli, Klebsiella aerogenes*

A total of 26 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.2% and CA of 84.6%. There were three (3) minor errors, no major errors, and one (1) very major error (1/8 = 12.5%). The <90% CA was considered acceptable since the majority of the categorical errors were minor and the EA of evaluable results was high. The very major error is considered a random error due to the limited number of resistant isolates tested. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Morganella morganii* isolates.

Levofloxacin
A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

Meropenem
A total of 31 *E. cloacae* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.3% and CA of 93.6%. There were no minor errors, no major errors, and two (2) very major errors (2/2 = 100%). The following limitation is included in the device labeling to address the unacceptable very major error rate by restricting reporting at an ASTar MIC of 0.5 or 1 µg/mL:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Meropenem: Enterobacter cloacae complex when the ASTar MIC is 0.5 µg/mL or 1 µg/mL due to two very major discrepancies*

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 43 *K. oxytoca* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 95.4% and CA of 97.7%. There were no minor errors, one (1) major error (1/35 = 2.9%), and no very major errors. Performance is acceptable.

A total of 99 *K. pneumoniae* group were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 92.9% and CA of 92.9%. There were six (6) minor errors, one (1) major error (1/69 = 1.4%), and no very major errors. Performance is acceptable.

A total of 30 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.0% and CA of 90.0%. There were three (3) minor errors, no major errors, and no very major errors. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Enterobacter cloacae* complex, *Klebsiella aerogenes,* and *Morganella morganii* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Meropenem: Klebsiella aerogenes, Klebsiella oxytoca, Klebsiella pneumoniae group*

Meropenem-vaborbactam

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 17 *P. vulgaris* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Morganella morganii* and *Proteus vulgaris* isolates.

Piperacillin-tazobactam
A total of 46 *A. baumannii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.8% and CA of 95.7%. There were two (2) minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 19 *C. freundii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 25 *E. cloacae* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 88.0% and CA of 92.0%, which is not acceptable. There was one (1) minor error, one (1) major error (1/16 = 6.3%), and no very major errors. Due to the unacceptable EA and major error rate, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.5% and CA of 90.5%. There was one (1) minor error, no major errors, and one (1) very major error (1/5 = 20%). The very major error is considered a random error due to the limited number of resistant isolates tested, and performance is acceptable.

A total of 43 *K. oxytoca* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 72.1% and CA of 83.7%, which is not acceptable. There were five (5) minor errors, two (2) major errors (2/26 = 7.7%), and no very major errors. Due to the unacceptable EA, CA and major error rate, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 96.3% and CA of 96.3%. There was one (1) minor error, no major errors, and no very major errors. Performance is acceptable.

A total of 59 *P. aeruginosa* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 81.4% and CA of 89.8%, which is not acceptable. There were four (4) minor errors, one (1) major error (1/44 = 2.3%), and one (1) very major error (1/11 = 9.1%). Due to the unacceptable EA, CA and very major error rate, this antimicrobial/ organism combination is not indicated for use with the ASTar System and the limitation below is included in the device labeling:

The following limitation is included in the device labeling to address the unacceptable performance discussed above:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Piperacillin-tazobactam: Enterobacter cloacae complex, Klebsiella oxytoca Pseudomonas aeruginosa*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Piperacillin-tazobactam: Acinetobacter baumannii, Citrobacter freundii, Klebsiella aerogenes*

Tobramycin

A total of 21 *K. aerogenes* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 43 *K. oxytoca* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.7% and CA of 88.4%. There were four (4) minor errors, one (1) major error (1/24 = 4.2%), and no very major errors. The <90% CA was considered acceptable since the majority of the categorical errors were minor and the EA of evaluable results was high. The limitation below is included in the device labeling to address the unacceptable the major error rate by restricting reporting at an ASTar MIC of 32 µg/mL.

A total of 27 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 88.5% and CA of 76.9%, which is not acceptable. There were six (6) minor errors, no major errors, and no very major errors. Due to the unacceptable EA and CA, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Tobramycin: Klebsiella oxytoca when the ASTar MIC is 32 µg/mL due to one major discrepancy, Morganella morganii*

A total of 17 *P. vulgaris* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 94.1% and CA of 88.2%. There were two (2) minor errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high. Performance is acceptable.

A total of 60 *P. aeruginosa* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 90.0% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance was acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Klebsiella aerogenes* and *Proteus vulgaris* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Tobramycin: Klebsiella aerogenes, Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aeruginosa*

Trimethoprim-sulfamethoxazole
A total of 19 *C. freundii* complex were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 22 *C. koseri* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 22 *M. morganii* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable.

A total of 37 *P. mirabilis* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 91.9% and CA of 95.6%. There were no minor errors, two (2) major errors (2/19 = 10.5%), and no very major errors. Due to the lack of an intermediate breakpoint, further analysis of the errors was performed, and adjustments were made by considering the MIC values of the errors compared to the reference MIC values. None of the two major errors were in essential agreement with the reference MIC values. Therefore, the adjusted major error rate was 10.5% (2/19), which is still not acceptable. Due to the unacceptable major error rate, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the limitation below is included in the device labeling.

A total of 33 *S. marcescens* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 87.9% and CA of 100%, which is not acceptable. There were no minor errors, no major errors, and no very major errors. Due to the unacceptable EA, this antimicrobial/ organism combination is not indicated for use with the ASTar System, and the following limitation is included in the device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Trimethoprim-sulfamethoxazole: Proteus mirabilis, Serratia marcescens*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex isolates.

Based on the performance described above, the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Trimethoprim-sulfamethoxazole: Citrobacter freundii complex*

Table 4. Acceptable ASTar Performance of Additional Organisms with Previously Cleared Antimicrobials

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Amikacin: *Acinetobacter baumannii* complex [≤8 (S), 16 (I), ≥32 (R)]													
Challenge	23	22	95.7	6	5	83.3	23	100	14	9	0	0	0
Fresh	2	2	100	1	1	100	2	100	0	2	0	0	0
Seeded Clinical	25	24	96.0	11	10	90.9	24	96.0	3	21	1	0	0
Combined	50	48	96.0	18	16	88.9	49	98.0	17	32	1	0	0
Amikacin: *Citrobacter koseri* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Seeded Clinical	18	17	94.4	1	0	0	17	94.4	0	17	1	0	0
Combined	22	21	95.5	1	0	0	21	95.5	0	21	1	0	0
Amikacin: *Escherichia coli* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	33	33	100	1	1	100	32	97.0	5	28	1	0	0
Fresh	86	84	97.7	16	14	87.5	86	100	1	4	0	0	0
Seeded Clinical	12	12	100	4	4	100	12	100	0	10	0	0	0
Combined	131	129	98.5	21	19	90.5	130	99.2	6	122	1	0	0
Amikacin: *Morganella morganii* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	22	21	95.5	4	3	75.0	21	95.5	2	20	1	0	0
Combined	27	26	96.3	4	3	75.0	26	96.3	2	25	1	0	0
Amikacin: *Proteus vulgaris* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	14	14	100	2	2	100	14	100	0	14	0	0	0
Combined	16	16	100	2	2	100	16	100	0	16	0	0	0
Ampicillin-sulbactam: *Acinetobacter baumannii* complex [≤8/4 (S), 16/8 (I), ≥32/16 (R)]													
Challenge	23	23	100	20	20	100	23	100	16	7	0	0	0
Fresh	2	2	100	2	2	100	2	100	0	1	0	0	0
Seeded Clinical	25	23	92	24	22	91.7	20	80.0	6	14	5	0	0
Combined	50	48	96.0	46	44	95.7	45	90.0	22	22	5	0	0
Ampicillin-sulbactam: *Citrobacter koseri* [≤8/4(S), 16/8 (I), ≥32/16 (R)]													
Challenge	4	4	100	4	4	100	4	100	0	4	0	0	0
Seeded Clinical	18	18	100	14	14	100	18	100	4	13	0	0	0
Combined	22	22	100	18	18	100	22	100	4	17	0	0	0
Ampicillin-sulbactam: *Morganella morganii* [≤8/4(S), 16/8 (I), ≥32/16 (R)]													
Challenge	3	3	100	2	2	100	3	100	0	1	0	0	0
Fresh	2	2	100	2	2	100	2	100	2	0	0	0	0
Seeded Clinical	22	21	95.5	18	17	94.4	18	81.8	11	2	4	0	0
Combined	27	26	96.3	22	21	95.5	23	85.2	13	3	4	0	0
Aztreonam: *Citrobacter freundii* complex [≤4 (S), 8 (I), ≥16 (R)]													

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Challenge	16	16	100	0	0	n/a	16	100	0	16	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Fresh	2	2	100	1	1	100	2	100	1	1	0	0	0
Combined	19	19	100	1	1	100	19	100	1	18	0	0	0
Aztreonam: *Morganella morganii* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	21	20	95.2	6	5	83.3		95.2	4	17	1	0	0
Combined	26	25	96.2	6	5	83.3	25	96.2	4	22	1	0	0
Aztreonam: *Pseudomonas aeruginosa* [≤8 (S), 16 (I), ≥32 (R)]													
Challenge	27	45	95.7	38	36	94.7	43	91.5	12	29	4	0	0
Fresh	12	12	100	12	12	100	9	75.0	2	8	3	0	0
Seeded Clinical	24	20	83.3	21	17	81.0	16	66.7	7	13	8	0	0
Combined	83	77	92.8	71	65	91.6	68	81.9	21	50	15	0	0
Cefazolin: *Citrobacter koseri* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	4	4	100	4	4	100	3	75.0	0	3	1	0	0
Seeded Clinical	18	18	100	13	13	100	18	100	5	13	0	0	0
Combined	22	22	100	17	17	100	21	95.5	5	16	1	0	0
Cefazolin: *Escherichia coli* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	33	33	100	27	27	100	33	100	6	26	0	0	0
Fresh	86	83	96.5	66	63	95.5	77	89.5	23	61	9	0	0
Seeded Clinical	12	12	100	4	4	100	12	100	8	4	0	0	0
Combined	131	128	97.7	97	94	96.9	122	93.1	37	91	9	0	0
Cefazolin: *Klebsiella oxytoca* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	4	4	100	3	3	100	4	100	3	1	0	0	0
Fresh	4	3	75	3	2	66.7	1	25	1	1	2	1	0
Seeded Clinical	35	35	100	13	13	100	33	94.3	28	3	2	0	0
Combined	43	42	97.7	19	18	94.7	38	88.4	32	5	4	1	0
Cefazolin: *Proteus mirabilis* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	3	3	100	3	3	100	3	100	1	0	0	0	0
Fresh	7	7	100	7	7	100	5	71.4	0	2	2	0	0
Seeded Clinical	27	26	96.3	13	12	92.3	24	88.9	15	3	3	0	0
Combined	37	36	97.3	23	22	95.7	32	86.5	16	5	5	0	0
Cefepime: *Citrobacter koseri* [≤2 (S), 4-8 (SDD), ≥16 (R)]													
Challenge	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Seeded Clinical	18	17	94.4	2	1	50.0	18	100	5	13	0	0	0
Combined	22	21	95.5	2	1	50.0	22	100	5	17	0	0	0
Cefepime: *Enterobacter cloacae* complex [≤2 (S), 4-8 (SDD), ≥16 (R)]													
Challenge	17	15	88.2	6	4	66.7	16	94.1	5	12	1	0	0
Fresh	6	6	100	1	1	100	6	100	0	6	0	0	0
Seeded Clinical	2	2	100	1	1	100	2	100	0	1	0	0	0
Combined	25	23	92.0	8	6	75.0	24	96.0	5	19	1	0	0
Ceftazidime: *Acinetobacter baumannii* complex [≤8 (S), 16 (I), ≥32 (R)]													
Challenge	23	23	100	8	8	100	23	100	16	7	0	0	0
Fresh	2	2	100	2	2	100	2	100	0	1	0	0	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Seeded Clinical	25	24	96.0	6	5	83.3	21	84.0	21	1	4	0	0
Combined	50	49	98.0	16	15	93.8	46	92.0	37	9	4	0	0
Ceftazidime: *Citrobacter freundii* complex [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	16	16	100	0	0	n/a	16	100	0	16	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	2	2	100	1	1	100	2	100	1	1	0	0	0
Combined	19	19	100	1	1	100	19	100	1	18	0	0	0
Ceftazidime: *Citrobacter koseri* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Seeded Clinical	18	18	100	1	1	100	18	100	5	13	0	0	0
Combined	22	22	100	1	1	100	22	100	5	17	0	0	0
Ceftazidime: *Klebsiella aerogenes* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	18	18	100	5	5	100	18	100	3	15	0	0	0
Fresh	3	1	33.3	2	0	0	3	100	2	1	0	0	0
Combined	21	19	90.5	7	5	71.43	21	100	5	16	0	0	0
Ceftazidime: *Morganella morganii* [≤4 (S), 8 (I), ≥16 (R)													
Challenge	3	3	100	0	0	n/a	3	100	0	03	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	21	2	95.2	6	5	83.3	19	90.5	7	13	1	1	0
Combined	26	25	96.2	6	5	83.3	24	92.3	7	18	1	1	0
Ceftazidime-avibactam: *Escherichia coli* [≤8/4 (S), - (I), ≥ 16/4 (R)]													
Challenge	33	33	100	0	0	n/a	33	100	5	28	0	0	0
Fresh	86	85	98.8	1	0	0	85	98.8	1	85	0	1	0
Seeded Clinical	12	11	91.7	2	1	50	12	100	0	12	0	0	0
Combined	131	129	98.5	3	1	33.3	130	99.2	6	125	0	1	0
Ceftazidime-avibactam: *Klebsiella aerogenes* [≤8/4 (S), - (I), ≥16/4 (R)]													
Challenge	18	18	100	0	0	n/a	18	100	1	17	0	0	0
Fresh	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Combined	21	21	100	0	0	n/a	21	100	1	20	0	0	0
Ceftazidime-avibactam: *Klebsiella pneumoniae* group [≤8/4 (S), - (I), ≥16/4 (R)]													
Challenge	37	35	94.6	8	6	75.0	37	100	3	34	0	0	0
Fresh	41	41	100	1	1	100	41	100	1	40	0	0	0
Seeded Clinical	19	18	94.7	6	5	83.3	19	100	4	15	0	0	0
Combined	97	94	96.9	15	12	80.0	97	100	8	89	0	0	0
Ceftazidime-avibactam: *Morganella morganii* [≤8/4 (S), - (I), ≥16/4 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Fresh	22	22	100	1	1	100	22	100	0	22	0	0	0
Combined	27	27	100	1	1	100	27	100	0	27	0	0	0
Ceftazidime-avibactam: *Proteus vulgaris* [≤8/4 (S), - (I), ≥16/4 (R)]													
Challenge	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Fresh	15	15	100	0	0	n/a	15	100	0	15	0	0	0
Combined	17	17	100	0	0	n/a	17	100	0	17	0	0	0
Cefuroxime: *Citrobacter koseri* [≤8 (S), - (I), ≥16 (R)]													

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Challenge	4	4	100	4	4	100	3	75.0	1	3	0	0	1
Seeded Clinical	18	17	94.4	13	12	92.3	18	100	7	11	0	0	0
Combined	22	21	95.5	17	16	94.1	21	95.5	8	14	0	0	1
Ciprofloxacin: *Citrobacter freundii* complex [≤0.25 (S), 0.5 (I), ≥1 (R)]													
Challenge	16	16	100	1	1	100	16	100	0	16	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Combined	19	19	100	1	1	100	19	100	0	19	0	0	0
Ciprofloxacin: *Morganella morganii* [≤0.25 (S), 0.5 (I), ≥1 (R)]													
Challenge	3	3	100	1	1	100	2	66.7	1	2	1	0	0
Fresh	2	2	100	0	0	n/a	2	100	1	1	0	0	0
Seeded Clinical	22	22	100	3	3	100	22	100	8	14	0	0	0
Combined	27	27	100	4	4	100	26	96.3	10	17	1	0	0
Gentamicin: *Morganella morganii* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	3	2	66.7	3	2	66.7	2	66.7	1	2	0	0	1
Fresh	1	1	100	1	1	100	1	100	0	1	0	0	0
Seeded Clinical	22	22	100	21	21	100	19	86.4	7	15	3	0	0
Combined	26	25	96.2	25	24	96.0	22	84.6	8	18	3	0	1
Levofloxacin: *Morganella morganii* [≤0.5 (S), 1 (I), ≥2 (R)]													
Challenge	3	3	100	1	1	100	2	66.7	0	2	1	0	0
Fresh	2	2	100	1	1	100	2	100	1	1	0	0	0
Seeded Clinical	22	22	100	4	4	100	22	100	8	14	0	0	0
Combined	27	27	100	6	6	100	26	96.3	9	17	1	0	0
Meropenem: *Enterobacter cloacae* complex [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	23	19	82.6	5	1	20.0	21	91.3	4	19	0	0	2
Fresh	6	6	100	0	0	n/a	6	166	0	6	0	0	0
Seeded Clinical	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Combined	31	28	90.0	5	1	20.0	29	93.6	4	27	0	0	2
Meropenem: *Klebsiella aerogenes* [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	18	18	100	1	1	100	17	94.4	0	17	1	0	0
Fresh	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Combined	21	21	100	1	1	100	20	95.2	0	20	1	0	0
Meropenem: *Klebsiella oxytoca* [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Fresh	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Seeded Clinical	35	33	94.3	7	5	71.4	34	94.1	8	27	0	1	0
Combined	43	41	95.4	7	5	71.4	42	97.7	8	35	0	1	0
Meropenem: *Klebsiella pneumoniae* group [≤1 (S), 2 (I), ≥5 (R)]													
Challenge	39	37	94.9	11	9	81.8	35	89.7	18	20	4	0	0
Fresh	41	39	95.1	2	0	0	39	95.1	0	10	1	1	0
Seeded Clinical	19	16	84.2	8	5	62.5	18	94.7	9	9	1	0	0
Combined	99	92	92.9	21	14	66.7	92	92.9	27	69	6	1	0
Meropenem: *Morganella morganii* [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	6	6	100	0	0	n/a	6	100	0	6	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Seeded Clinical	22	19	86.4	4	1	15.0	19	86.4	1	20	3	0	0
Combined	30	27	90.0	4	1	25.0	27	90.0	1	28	3	0	0
Meropenem-vaborbactam: *Morganella morganii* [≤4/8 (S), 8/8 (I), ≥16/8 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	22	22	100	0	0	n/a	22	100	0	22	0	0	0
Combined	27	27	100	0	0	n/a	27	100	0	27	0	0	0
Meropenem-vaborbactam: *Proteus vulgaris* [≤4/8 (S), 8/8 (I), ≥16/8 (R)]													
Challenge	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	15	15	100	0	0	n/a	15	100	0	15	0	0	0
Combined	17	17	100	0	0	n/a	17	100	0	17	0	0	0
Piperacillin-tazobactam: *Acinetobacter baumannii* complex [≤16/4 (S), 32/4-64/4 (I), ≥128/4 (R)]													
Challenge	21	21	100	10	10	100	21	100	16	5	0	0	0
Fresh	2	2	100	2	2	100	2	100	2	0	0	0	0
Seeded Clinical	23	22	95.7	15	14	93.3	21	91.3	17	1	2	0	0
Combined	46	45	97.8	27	26	96.3	44	95.7	35	6	2	0	0
Piperacillin-tazobactam: *Citrobacter freundii* complex [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	16	16	100	10	10	100	16	100	0	16	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	2	2	100	2	2	100	2	100	1	1	0	0	0
Combined	19	19	100	12	12	100	19	100	1	18	0	0	0
Piperacillin-tazobactam: *Klebsiella aerogenes* [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	18	16	88.9	17	15	88.2	16	88.9	3	15	1	0	1
Fresh	3	3	100	3	3	100	3	100	2	1	0	0	0
Combined	21	19	90.5	20	18	90.0	19	90.5	5	16	1	0	1
Piperacillin-tazobactam: *Morganella morganii* [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	22	21	95.5	4	3	75.0	21	95.5	3	18	1	0	0
Combined	27	26	96.3	4	3	75.0	26	96.3	3	23	1	0	0
Tobramycin: *Klebsiella aerogenes* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	18	18	100	18	18	100	18	100	1	17	0	0	0
Fresh	3	3	100	3	3	100	3	100	0	3	0	0	0
Combined	21	21	100	21	21	100	21	100	1	20	0	0	0
Tobramycin: *Klebsiella oxytoca* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	4	4	100	4	4	100	4	100	0	4	0	0	0
Fresh	4	3	100	4	3	75.0	4	100	1	3	0	0	0
Seeded Clinical	35	32	91.4	35	32	91.4	30	85.7	13	17	4	1	0
Combined	43	39	90.7	43	39	90.7	38	88.4	14	24	4	1	0
Tobramycin: *Proteus vulgaris* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	1	1	100	1	1	100	1	100	0	1	0	0	0
Fresh	1	1	100	1	1	100	1	100	0	1	0	0	0
Seeded Clinical	15	14	93.3	15	14	93.3	13	86.7	1	12	2	0	0
Combined	17	16	94.1	17	16	94.1	15	88.2	1	14	2	0	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Tobramycin: *Pseudomonas aeruginosa* [≤1 (S), 2 (I), ≥4 (R)]													
Challenge	24	23	95.8	20	19	95.0	24	100	3	21	0	0	0
Fresh	12	8	66.7	12	8	66.7	12	100	0	12	0	0	0
Seeded Clinical	24	23	95.8	24	23	95.8	24	100	1	23	0	0	0
Combined	60	54	90.0	56	50	89.3	60	100	4	56	0	0	0
Trimethoprim-sulfamethoxazole: *Citrobacter freundii* complex [≤2/38 (S), - (I), ≥4/76 (R)]													
Challenge	16	16	100	0	0	n/a	16	100	1	15	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Combined	19	19	100	0	0	n/a	19	100	1	18	0	0	0
Trimethoprim-sulfamethoxazole: *Citrobacter koseri* [≤2/38 (S), - (I), ≥4/76 (R)]													
Challenge	4	4	100	0	0	n/a	4	100	0	4	0	0	0
Seeded Clinical	18	18	100	1	1	100	18	100	4	14	0	0	0
Combined	22	22	100	1	1	100	22	100	4	18	0	0	0
Trimethoprim-sulfamethoxazole: *Morganella morganii* [≤2/38 (S), - (I), ≥4/76 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	1	2	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	1	1	0	0	0
Seeded Clinical	22	22	100	0	0	n/a	22	100	7	15	0	0	0
Combined	27	27	100	0	0	n/a	27	100	9	18	0	0	0

EA – Essential Agreement
CA – Category Agreement
R – Resistant
S – Susceptible
SDD-Susceptible-Dose Dependent

Eval – Evaluable MIC Results
min – Minor Discrepancies
maj – Major Discrepancies
vmj – Very Major Discrepancies

Essential Agreement (EA) occurs when there is agreement between the reference method and ASTar MIC results within plus or minus one serial two-fold dilution of the antibiotic. Evaluable results are those that are on-scale for both the ASTar and the reference method or those in which an off-scale result is at least two doubling dilutions from the on-scale result. Category Agreement (CA) occurs when the interpretation of the reference method and ASTar result are in exact agreement.

Table 5. Unacceptable ASTar Performance of Additional Organisms with Previously Cleared Antimicrobials

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Cefepime: *Morganella morganii* [≤2 (S), 4-8 (SDD), ≥16 (R)]													
Challenge	3	3	100	0	0	n/a	3	100	0	3	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	22	19	86.4	6	3	50.0	20	90.9	3	19	0	1	1
Combined	27	24	88.9	6	3	50.0	25	92.6	3	24	0	1	1
Ceftazidime: *Pseudomonas aeruginosa* [≤8 (S), 16 (I), ≥32 (R)]													
Challenge	24	23	95.8	21	20	95.2	23	95.8	4	20	0	0	1
Fresh	12	12	100	12	12	100	12	100	1	11	0	0	0
Seeded Clinical	24	19	79.2	18	13	72.2	22	91.7	9	14	2	0	0
Combined	60	54	90.0	51	45	88.2	57	95.0	14	45	2	0	1

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Cefuroxime: *Enterobacter cloacae* complex [≤8 (S), - (I), ≥16 (R)]													
Challenge	17	16	94.1	8	7	87.5	15	88.2	11	6	0	0	2
Fresh	6	5	83.3	6	5	83.3	5	83.3	2	4	0	0	1
Seeded Clinical	2	2	100	1	1	100	2	100	1	1	0	0	0
Combined	25	23	92.0	15	13	86.7	22	88.0	14	11	0	0	3
Cefuroxime: *Klebsiella aerogenes* [≤8 (S), - (I), ≥16 (R)]													
Challenge	17	14	82.4	14	11	78.6	14	82.4	7	10	0	0	3
Fresh	3	2	66.7	2	1	50.0	3	100	2	1	0	0	0
Combined	20	16	80.0	16	12	75.0	17	85.0	9	11	0	0	3
Gentamicin: *Enterobacter cloacae* complex [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	17	13	76.5	13	9	69.2	16	94.1	6	11	1	0	0
Fresh	6	4	66.7	6	4	66.7	6	100	0	6	0	0	0
Seeded Clinical	2	1	50.0	2	1	50.0	2	100	0	2	0	0	0
Combined	25	18	72.0	21	14	66.7	24	96.0	6	19	1	0	0
Gentamicin: *Escherichia coli* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	33	33	100	27	27	100	33	100	5	28	0	0	0
Fresh	86	72	83.7	80	66	82.5	86	100	8	77	0	0	0
Seeded Clinical	12	10	83.3	11	9	81.8	11	91.7	4	8	1	0	0
Combined	131	115	87.8	118	102	86.4	130	99.2	17	113	1	0	0
Gentamicin: *Klebsiella aerogenes* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	18	15	83.3	16	13	81.3	18	100	1	17	0	0	0
Fresh	3	3	100	3	3	100	3	100	0	3	0	0	0
Combined	21	18	85.7	19	16	84.2	21	100	1	20	0	0	0
Piperacillin-tazobactam: *Enterobacter cloacae* complex [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	17	14	82.4	16	13	81.3	15	88.2	6	10	1	1	0
Fresh	6	6	100	4	4	100	6	100	0	5	0	0	0
Seeded Clinical	2	2	100	2	2	100	2	100	1	1	0	0	0
Combined	25	22	88.0	22	19	86.4	23	92.0	7	16	1	1	0
Piperacillin-tazobactam: *Klebsiella oxytoca* [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	4	1	25.0	4	1	25.0	3	75.0	0	3	1	0	0
Fresh	4	3	75.0	4	3	75.0	3	75.0	0	4	0	1	0
Seeded Clinical	35	27	77.1	24	16	66.7	30	85.7	14	19	4	1	0
Combined	43	31	72.1	32	20	62.5	36	83.7	14	26	5	2	0
Piperacillin-tazobactam: *Pseudomonas aeruginosa* [≤16/4 (S), 32/4 (I), ≥64/4 (R)]													
Challenge	24	21	87.5	21	18	85.7	23	95.8	3	20	0	0	1
Fresh	11	10	90.9	11	10	90.9	10	90.9	1	9	1	0	0
Seeded Clinical	24	17	70.8	22	15	68.2	20	73.3	7	15	3	1	0
Combined	59	48	81.4	54	43	79.6	53	89.8	11	44	4	1	1
Tobramycin: *Morganella morganii* [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	3	1	33.3	3	1	33.3	2	66.7	0	2	1	0	0
Fresh	1	1	100	1	1	100	1	100	0	1	0	0	0
Seeded Clinical	22	21	95.5	22	21	95.5	17	77.3	2	15	5	0	0
Combined	26	23	88.5	26	23	88.5	20	76.9	2	18	6	0	0
Trimethoprim-sulfamethoxazole: *Proteus mirabilis* [≤2/38 (S), - (I), ≥4/76 (R)]													
Challenge	3	2	66.7	1	0	0	3	100	2	1	0	0	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Fresh	7	5	71.4	2	0	0	5	71.4	1	6	0	2	0
Seeded Clinical	27	27	100	0	0	n/a	27	100	15	12	0	0	0
Combined	37	34	91.9	3	0	0	35	95.6	18	19	0	2	0
Trimethoprim-sulfamethoxazole: *Serratia marcescens* [≤2/38 (S), - (I), ≥4/76 (R)]													
Challenge	11	10	90.9	1	0	0	11	100	0	11	0	0	0
Fresh	2	2	100	0	0	n/a	2	100	0	2	0	0	0
Seeded Clinical	20	17	85.0	3	0	0	20	100	3	17	0	0	0
Combined	33	29	87.9	4	0	0	33	100	3	30	0	0	0

EA – Essential Agreement
CA – Category Agreement
R – Resistant
S – Susceptible
SDD-Susceptible-Dose Dependent

Eval – Evaluable MIC Results
min – Minor Discrepancies
maj – Major Discrepancies
vmj – Very Major Discrepancies

Essential Agreement (EA) occurs when there is agreement between the reference method and ASTar MIC results within plus or minus one serial two-fold dilution of the antibiotic. Evaluable results are those that are on-scale for both the ASTar and the reference method or those in which an off-scale result is at least two doubling dilutions from the on-scale result. Category Agreement (CA) occurs when the interpretation of the reference method and ASTar result are in exact agreement.

C. ASTar Performance of Additional Testing to Remove Performance Limitations of Existing Claims

In the current 510(k) premarket submission, additional clinical evaluation testing was performed following software updates of the ASTar BC G- Kit with the ASTar Instrument to support the removal of limitations included in the previous device clearance (K221688) for aztreonam, cefepime, piperacillin-tazobactam, and tobramycin. The performance data for these antimicrobial/organism combinations is provided in **Table 6**.

Aztreonam/*E. coli*
A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 100% and CA of 100%. There were three (3) minor errors, no major errors, and no very major errors. Performance is acceptable and the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Aztreonam: Escherichia coli when the ASTar MIC is 0.5 µg/mL due to one very major discrepancy*

Cefepime/*P. vulgaris*
A total of 17 *P. vulgaris* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 94.1% and CA of 100%. There were no minor errors, no major errors, and no very major errors. Performance is acceptable and the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Cefepime: Proteus vulgaris when the ASTar MIC is 32 µg/mL due to one major discrepancy*

Piperacillin-tazobactam/*E. coli*
A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.7% and CA of 97.0%. There were four (4) minor errors, no major errors, and no very major errors. Performance is acceptable and the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Piperacillin-tazobactam: Escherichia coli when the ASTar MIC is 8 µg/mL due to one very major discrepancy*

Piperacillin-tazobactam/*K. pneumoniae* group
A total of 99 *K. pneumoniae* group were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.0% and CA of 96.9%. There were five (5) minor errors, one (1) major error (1/64 = 1.6%), and no very major errors. Performance is acceptable and the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Piperacillin-tazobactam: Klebsiella pneumoniae group when the ASTar MIC is 8 µg/mL due to two very major discrepancies*

Tobramycin /*K. pneumoniae* group
A total of 131 *E. coli* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 97.7% and CA of 97.0%. There were four (4) minor errors, no major errors, and no very major errors. Performance is acceptable and the following limitation was removed from device labeling:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Piperacillin-tazobactam: Klebsiella pneumoniae group when the ASTar MIC is 4 µg/mL due to one very major discrepancy*

Table 6. ASTar Performance of Additional Testing to Remove Performance Limitations of Existing Claims

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Aztreonam: *Escherichia coli* [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	33	33	100	3	3	100	32	97.0	3	29	1	0	0
Fresh	86	86	100	13	13	100	85	98.8	11	70	1	0	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Seeded Clinical	12	12	100	5	5	100	11	91.7	7	5	1	0	0
Combined	131	131	100	21	21	100	128	97.7	21	104	3	0	0
Cefepime: *Proteus vulgaris* [≤2 (S), 4-8 (SDD), ≥16 (R)]													
Challenge	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Fresh	1	1	100	0	0	n/a	1	100	0	1	0	0	0
Seeded Clinical	15	14	93.3	1	0	0	15	100	1	14	0	0	0
Combined	17	16	94.1	1	0	0	17	100	1	16	0	0	0
Piperacillin-tazobactam: *Escherichia coli* [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	33	33	100	18	18	100	33	100	7	26	0	0	0
Fresh	86	85	98.8	54	53	98.2	84	97.7	4	81	2	0	0
Seeded Clinical	12	10	83.3	8	6	75.0	10	83.3	5	7	2	0	0
Combined	131	128	97.7	80	77	96.3	127	97.0	16	114	4	0	0
Piperacillin-tazobactam: *Klebsiella pneumoniae* group [≤8/4 (S), 16/4 (I), ≥32/4 (R)]													
Challenge	39	36	92.3	20	17	85	39	100	23	14	0	0	0
Fresh	40	37	92.5	37	34	91.9	34	85.0	3	31	5	1	0
Seeded Clinical	19	18	94.7	8	7	87.5	17	89.2	13	5	2	0	0
Combined	98	91	92.9	65	58	89.2	90	91.8	39	50	7	1	0
Tobramycin: *Klebsiella pneumoniae* group [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	39	38	97.4	36	35	97.2	37	95.9	18	20	2	0	0
Fresh	41	40	97.6	41	40	97.6	41	100	5	36	0	0	0
Seeded Clinical	19	18	94.7	18	17	94.4	15	79.0	10	8	3	1	0
Combined	99	96	97.0	95	92	96.8	93	96.9	33	64	5	1	0

EA – Essential Agreement
CA – Category Agreement
R – Resistant
S – Susceptible
SDD-Susceptible-Dose Dependent

Eval – Evaluable MIC Results
min – Minor Discrepancies
maj – Major Discrepancies
vmj – Very Major Discrepancies

Essential Agreement (EA) occurs when there is agreement between the reference method and ASTar MIC results within plus or minus one serial two-fold dilution of the antibiotic. Evaluable results are those that are on-scale for both the ASTar and the reference method or those in which an off-scale result is at least two doubling dilutions from the on-scale result. Category Agreement (CA) occurs when the interpretation of the reference method and ASTar result are in exact agreement.

D. ASTar Performance of Antimicrobials with Updated Breakpoints

For some antimicrobial/organism combinations cleared in K221688, the FDA STIC breakpoints have been updated following clearance. The original clinical and challenge data for the following combinations reviewed in K221688 were reanalyzed with the updated breakpoints, as appropriate. The reanalysis of Category Agreement (CA) and discrepancy rates is provided in **Table 7**. Essential Agreement (EA) performance provided in the table remains unchanged from K221688.

Amikacin/Enterobacterales
The FDA STIC-recognized breakpoints for amikacin with Enterobacterales have been updated since the clearance of K221688. The original clinical and challenge data were reanalyzed, and performance was evaluated with the updated breakpoints (**Table 7**).

A total of 460 Enterobacterales (27 *C. freundii* complex, 65 *E. cloacae* complex, 48 *K. aerogenes*, 50 *K. oxytoca*, 142 *K. pneumoniae* group, 89 *P. mirabilis*, and 39 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 97.6% and CA of 97.0%. There were thirteen (13) minor errors, one (1) major error (1/426 = 0.2%), and no very major errors. The performance with the updated breakpoints is acceptable.

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex, *Enterobacter cloacae* complex, *Klebsiella aerogenes, Klebsiella oxytoca, Proteus mirabilis,* and *Serratia marcescens* isolates.

Based on the performance, the following limitation was removed from device labeling:

> *The ability of the ASTar system to detect resistance in the following antimicrobial/ organism combinations is unknown because of an insufficient number of resistant isolates were available during the clinical study:*
> - *Amikacin: Klebsiella pneumoniae group*

Amikacin/*P. aeruginosa*
The current FDA STIC-recognized breakpoints for amikacin/*P. aeruginosa* only apply to organisms isolated from the urinary tract. Since the ASTar System reports results for organisms isolated from positive blood cultures, FDA STIC-recognized breakpoints should not be used for amikacin/*P. aeruginosa*. Therefore, the device labeling has been updated to remove any claims or limitations related to amikacin/*P. aeruginosa*.

Cefepime/Enterobacterales
The current FDA STIC-recognized were updated to reclassify the previous intermediate category (I) as a susceptible-dose dependent (SDD) category. This update has no impact on the clinical performance reviewed in K221688.

Cefepime/*P. aeruginosa*
The FDA STIC-recognized breakpoints for cefepime with *P. aeruginosa* have been updated since the clearance of K221688. The original clinical data was reanalyzed, and performance was evaluated with the updated breakpoints (**Table 7**).

A total of 88 *P. aeruginosa* were evaluated, and the combined results from the clinical and challenge testing demonstrated an EA of 95.5% and CA of 86.4%. There were twelve (12) minor errors, no major errors, and no very major errors. The <90% CA was considered acceptable since all of the categorical errors were minor and the EA of evaluable results was high.

Gentamicin/Enterobacterales
The FDA STIC-recognized breakpoints for gentamicin with Enterobacterales have been updated since the clearance of K221688. The original clinical data was reanalyzed, and performance was evaluated with the updated breakpoints (**Table 7**).

A total of 381 Enterobacterales (43 *C. freundii* complex, 22 *C. koseri*, 30 *K. oxytoca*, 140 *K. pneumoniae* group, 90 *P. mirabilis*, 34 *P. vulgaris* and 22 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 95.3% and CA of 97.9%. There were six (6) minor errors, one (1) major error (1/341 = 0.3%), and one (1) very major error (1/34 = 2.9%).

When evaluating by individual species, *K. pneumoniae* group had one (1) very major error (1/34 = 2.9%), which is not acceptable. The following limitation is included in the device labeling to address the unacceptable very major error rate with the updated breakpoints:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):
- *Gentamicin: Klebsiella pneumoniae group when the ASTar MIC is 2 µg/mL due to one very major discrepancy*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex, *Citrobacer koseri*, *Klebsiella oxytoca*, *Proteus vulgaris*, and *Serratia marcescens* isolates.

Based on the performance, the following limitation was removed from device labeling:

The ability of the ASTar system to detect resistance in the following antimicrobial/ organism combinations is unknown because of an insufficient number of resistant isolates were available during the clinical study:
- *Gentamicin: Proteus mirabilis*

Gentamicin/*P. aeruginosa*
There are no longer FDA STIC-recognized breakpoints for gentamicin/*P. aeruginosa*. Therefore, the device labeling has been updated to remove any claims or limitations related to gentamicin/*P. aeruginosa*.

Tobramycin/Enterobacterales
The FDA STIC-recognized breakpoints for gentamicin with Enterobacterales have been updated since the clearance of K221688. The original clinical data was reanalyzed, and performance was evaluated with the updated breakpoints (**Table 7**).

A total of 213 Enterobacterales (27 *C. freundii* complex, 42 *C. koseri*, 38 *E. cloacae* complex, 50 *E. coli*, 34 *P. mirabilis*, and 22 *S. marcescens*) were evaluated. The combined results from the clinical and challenge testing demonstrated an EA of 93.9% and CA of 92.0%. There were fifteen (15) minor errors, two (2) major errors (2/182 = 1.1%), and no very major errors. The overall performance with the updated breakpoints is acceptable.

When evaluating by individual species, *E. cloacae* complex had one (1) major error (1/31 = 3.2%), which is not acceptable. A limitation is included in the device labeling to address the unacceptable major error rate by restricting reporting at an ASTar MIC of 8 µg/mL. *S. marcescens* demonstrated an EA of 95.5% and CA of 68.2%, which is not acceptable. There were seven (7) minor errors, no major errors, and no very major errors. Due the unacceptable CA, this antimicrobial/organism combination is not indicated for use with the ASTar System. The following limitation is included in the device labeling to address the unacceptable major error rate of *E. cloacae* complex and the unacceptable CA of *S. marcescens*:

Perform an alternative method of testing prior to reporting results for the following antibiotic/organism combination(s):

- *Tobramycin: Enterobacter cloacae complex when the ASTar MIC is 8 µg/mL due to one major discrepancy, Serratia marcescens*

A limitation statement is included in the device labeling to address the lack of testing with resistant *Citrobacter freundii* complex, *Citrobacer koseri*, *Enterobacter cloacae* complex, and *Proteus mirabilis* isolates.

Based on the performance described above, the following limitation was removed from device labeling:

The ability of the ASTar system to detect resistance in the following antimicrobial/ organism combinations is unknown because of an insufficient number of resistant isolates were available during the clinical study:

- *Tobramycin: Escherichia coli*

Table 7. Reanalysis of Antimicrobials with Updated Breakpoints

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Amikacin: Enterobacterales [≤4 (S), 8 (I), ≥16 (R)]													
Challenge	218	217	99.5	42	41	97.6	210	96.3	12	200	8	0	0
Fresh	102	96	94.1	21	15	71.4	99	97.1	1	100	3	1	0
Seeded Clinical	140	136	97.1	25	21	84.0	137	97.9	9	126	2	1	0
Combined	460	449	97.6	88	77	87.5	446	97.0	22	426	13	1	0
Cefepime: *Pseudomonas aeruginosa* [≤8 (S), 16 (I), ≥32 (R)]													
Challenge	58	57	98.3	34	33	97.1	51	87.9	30	25	7	0	0
Fresh	16	14	87.5	16	14	87.5	12	75.0	1	12	4	0	0
Seeded Clinical	14	13	92.9	14	13	92.9	13	92.9	2	11	1	0	0
Combined	88	84	95.5	64	60	93.8	76	86.4	33	48	12	0	0
Gentamicin: Enterobacterales [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	204	196	96.1	169	161	95.3	201	98.5	17	183	2	0	1
Fresh	72	68	94.4	63	59	93.7	71	98.6	6	65	1	0	0
Seeded Clinical	105	99	94.3	88	82	93.2	101	96.2	11	93	3	1	0
Combined	381	363	95.3	320	302	94.4	373	97.9	34	341	6	1	1
Tobramycin: Enterobacterales [≤2 (S), 4 (I), ≥8 (R)]													
Challenge	112	107	95.5	111	106	95.5	102	91.1	7	93	9	1	0
Fresh	53	45	84.9	52	44	84.6	48	90.6	5	46	4	1	0

	Tot	No. EA	EA %	Eval EA Tot	No. Eval EA	Eval EA %	No. CA	CA %	No. R	No. S	min	maj	vmj
Seeded Clinical	48	48	100	48	48	100	46	95.8	3	43	2	0	0
Combined	213	200	93.9	211	198	93.8	196	92.0	15	182	15	2	0

EA – Essential Agreement
CA – Category Agreement
R – Resistant
S – Susceptible

Eval – Evaluable MIC Results
min – Minor Discrepancies
maj – Major Discrepancies
vmj – Very Major Discrepancies

Essential Agreement (EA) occurs when there is agreement between the reference method and ASTar MIC results within plus or minus one serial two-fold dilution of the antibiotic. Evaluable results are those that are on-scale for both the ASTar and the reference method or those in which an off-scale result is at least two doubling dilutions from the on-scale result. Category Agreement (CA) occurs when the interpretation of the reference method and ASTar result are in exact agreement.

MIC Trending

A trending analysis was conducted using the combined data (clinical and challenge) obtained for *Acinetobacter* spp., Enterobacterales, and *P. aeruginosa*. This trending calculation takes into account MIC values that are determined to be one or more doubling dilutions lower or higher than the reference method irrespective of whether the device MIC values are on-scale or not. MIC results that were off-scale for both the reference and ASTar were not considered in the trending analysis.

Species for which the difference between the percentage of isolates with higher vs. lower readings was ≥30% and for which the confidence interval was determined to be statistically significant were considered to show evidence of trending. Trending that shows higher or lower MIC values compared to the reference is addressed in the labeling.

Evaluation of results for *A. baumannii* complex, species of Enterobacterales, and *P. aeruginosa* with the ASTar BC G- Kit are summarized in **Tables 8 and 9**.

To address the MIC trending, the following statements are included as footnotes to the AST performance table:

ASTar MIC values for the following antimicrobial/organism combinations tended to be one doubling dilution lower than the reference MIC value:

- Amikacin: *M. morganii*
- Ceftolozane-tazobactam: *P. mirabilis*
- Ertapenem: *E. cloacae* complex, *P. mirabilis*, *S. marcescens*
- Levofloxacin: *M. morganii*
- Meropenem: *E. cloacae* complex
- Piperacillin-tazobactam: *M. morganii*
- Tobramycin: *P. vulgaris*

ASTar MIC values for the following antimicrobial/organism combinations tended to be one doubling dilution higher than the reference MIC value:

- Amikacin: *A. baumanni* complex
- Ampicillin-sulbactam: *C. koseri*
- Aztreonam: *E. coli*
- Cefazolin: *C. koseri, E. coli, K. oxytoca*
- Cefepime: *C. koseri*
- Cefotaxime: *K. pneumoniae* group
- Ceftazidime-avibactam: *K. pneumoniae* group
- Ceftolozane-tazobactam: *C. freundii* complex, *C. koseri*
- Ceftriaxone: *K. pneumoniae* group
- Piperacillin-tazobactam: *E. coli*, *K. aerogenes*, *K. pneumoniae* group
- Tobramycin: *K. aerogenes*, *K. pneumoniae* group, *P. aeruginosa*

Table 8. Trending of ASTar BC G- Kit with New Antimicrobials

Antimicrobial	Organism	Total Evaluable for Trending	≥1 Dilution Lower No. (%)	Exact No. (%)	≥1 Dilution Higher No. (%)	Percent Difference (95% CI)	Trending Noted
Cefotaxime	*A. baumanni* complex	24	7, (29.2)	13	4 (16.7)	-13% (-35%, 11%)	No
	C. freundii complex	0	0, (0)	0	0, (0)	0	n/a
	C. koseri	0	0, (0)	0	0, (0)	0	n/a
	E. cloacae complex	5	1, (20.0)	1	3, (60.0)	40%, (-16%, 73%)	No
	E. coli	4	1, (25.0)	2	1, (25.0)	0%, (-49%, 49%)	No
	K. oxytoca	3	0, (0)	2	1, (33.3)	33%, (-29%, 79%%)	No
	K. pneumoniae group	10	1, (10.0)	2	7, (70.0)	60%, (17%, 81%)	Yes
	P. mirabilis	3	1, (33.3)	2	0, (0)	-33%, (-79%, 29%)	No
	P. vulgaris	1	0, (0)	0	1, (100)	100%, (-12%, 100%)	No
	S. marcescens	13	5, (38.5)	4	4, (30.8)	8%, (-39%, 26%)	No
Cefoxitin	*C. koseri*	20	5 (25.0)	11	4 (20.0)	-5% (-30%, 21%)	No
	E. coli	116	20, (17.2)	81	15, (12.9)	-4%, (-14%, 5%)	No
	K. oxytoca	29	9, (31.0)	11	9, (31.0)	0%, (-23%, 23%)	No
	K. pneumoniae group	76	15, (19.7)	49	12, (15.8)	-4%, (-16%, 8%)	No
	P. mirabilis	36	7, (19.4)	22	7, (19.4)	0%, (-18%, 18%)	No
Ceftolozane-tazobactam	*Citrobacter freundii* complex	6	1, (16.7)	0	5, (83.3)	67%, (11%, 86%)	Yes
	C. koseri	5	0, (0)	2	3, (60.0)	60%, (3%, 88%)	Yes
	E. cloacae complex	12	6, (50.0)	2	4, (33.3)	-17%, (-48%, 20%)	No
	E. coli	13	4, (30.8)	6	3, (23.1)	-8%,	No

Antimicrobial	Organism	Total Evaluable for Trending	≥1 Dilution Lower No. (%)	Exact No. (%)	≥1 Dilution Higher No. (%)	Percent Difference (95% CI)	Trending Noted
						(-38%, 25%)	
	K. oxytoca	13	6, (46.2)	5	2, (15.4)	-31%, (-58%, 5%)	No
	K. pneumoniae group	41	18, (43.9)	7	16, (39.0)	-5%, (-25%, 16%)	No
	P. mirabilis	13	11, (84.6)	2	0, (0)	-85%, (54%, 94%)	Yes
	P. vulgaris	16	1, (6.3)	12	3, (18.8)	12%, (-13%, 37%)	No
	S. marcescens	30	4, (13.3)	16	10, (33.3)	20%, (-2%, 40%)	No
	P. aeruginosa	56	11, (19.6)	19	26, (46.4)	27%, (9%, 42%)	No
Ceftriaxone	*C. freundii* complex	0	0, (0)	0	0, (0)	0	n/a
	C. koseri	0	0, (0)	0	0, (0)	0	n/a
	E. cloacae complex	3	1, (33.3)	0	2, (66.7)	33%, (-32%, 72%)	No
	E. coli	3	2, (66.7)	1	0, (0)	-67%, (-94%, 6%)	No
	K. aerogenes	4	3, (75.0)	0	1, (25.0)	-50%, (-79%, 14%)	No
	K. oxytoca	4	1, (25.0)	2	1, (25.0)	0%, (-49%, 49%)	No
	K. pneumoniae group	7	0, (0)	3	4, (57.1)	57%, (9%, 84%)	Yes
	P. mirabilis	6	2, (33.3)	2	2, (33.3)	0%, (-44%, 44%)	No
	P. vulgaris	2	0, (0)	1	1, (50.0)	50%, (-27%, 91%)	No
	S. marcescens	8	3, (37.5)	4	1, (12.5)	-25%, (-59%, 17%)	No
Ertapenem	*C. freundii* complex	1	0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	C. koseri	2	1, (50.0)	0	1, (50.0)	0%, (-57%, 57%)	No
	E. cloacae complex	11	6, (54.6)	5	0, (0)	-55%, (-79%, -17%)	Yes
	E. coli	10	4, (40.0)	3	3, (30.0)	-10%, (-45%, 28%)	No
	K. oxytoca	7	1, (14.3)	5	1, (14.3)	0%, (-39%, 39%)	No
	K. pneumoniae group	15	7, (46.7)	2	6, (40.0)	-7%, (-37%, 26%0	No
	P. mirabilis	5	5, (100)	0	0, (0)	-100%, (-100%, -39%)	Yes
	P. vulgaris	0	0, (0)	0	0, (0)	0	n/a
	S. marcescens	3	3, (100)	0	0, (0)	-100%, (-100%, -21%)	Yes

n/a- not applicable

Table 9. Trending of ASTar BC G- Kit with Previously Cleared Antimicrobials/New Organism and Updated Antimicrobials/Organism Combinations

Antimicrobial	Organism	Total Evaluable for Trending	≥1 Dilution Lower No. (%)	Exact No. (%)	≥1 Dilution Higher No. (%)	Percent Difference (95% CI)	Trending Noted
Amikacin	*A. baumanni* complex	19	3, (15.8)	5	11 (57.9)	42% (11%, 64%)	Yes
	C. koseri	1	1, (100)	0	0, (0)	-100%, (-100%, 12%)	No
	E. coli	27	7, (25.9)	9	11, (40.7)	15%, (-10%, 37%)	No
	M. morganii	8	6, (75.0)	2	0, (0)	-75%, (-93%, -28%)	Yes
	P. vulgaris	4	2, (50.0)	1	1, (25.0)	-25%, (-66%, 32%)	No
Ampicillin-sulbactam	*A. baumannii* complex	46	10, (21.7)	28	8, (17.4)	-4%, (-12%, 20%)	No
	C. koseri	18	1, (5.6)	6	11, (61.1)	56%, (25%, 75%)	Yes
	M. morganii	23	2, (8.7)	14	7, (30.4)	22%, (-2%, 43%)	No
Aztreonam	*C. freundii* complex	1	0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	M. morganii	6	1, (16.7)	3	2, (33.3)	17%, (-30%, 56%)	No
	E. coli	25	0, (0)	16	9, (36.0)	36%, (15%, 55%)	Yes
	P. aeruginosa	72	16, (22.2)	26	30, (41.7)	19%, (4%, 34%)	No
Cefazolin	*C. koseri*	17	0, (0)	7	10, (58.8)	59%, (29%, 78%)	Yes
	E. coli	97	2, (2.1)	41	54, (55.7)	54%, (42%, 63%)	Yes
	K. oxytoca	19	2, (10.5)	8	9, (47.4)	37%, (8%, 59%)	Yes
	P. mirabilis	23	1, (4.4)	17	5, (21.7)	17%, (-3%, 38%)	No
Cefepime	*C. koseri*	4	0, (0)	1	3, (75.0)	75%, (9%, 95%)	Yes
	E. cloacae complex	8	0, (0)	6	2, (25.0)	25%, (-12%, 59%)	No
	P. vulgaris	1	1, (100)	0	0, (0)	-100%, (-100%, 12%)	No
Ceftazidime	*A. baumannii* complex	17	4, (23.5)	9	4, (23.5)	0%, (-28%, 28%)	No
	C. freundii complex	1	1, (100)	0	0, (0)	-100%, (-100%, 12%)	No
	C. koseri	1	0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	K. aerogenes	7	3, (42.9)	1	3, (42.9)	0%, (-42%, 42%)	No
	M morganii	8	2, (25.0)	3	3, (37.5)	12%, (-29%, 49%)	No
	E. coli	3	0, (0)	1	2, (66.7)	67%, (-5%, 94%)	No

Antimicrobial	Organism	Total Evaluable for Trending	≥1 Dilution Lower No. (%)	Exact No. (%)	≥1 Dilution Higher No. (%)	Percent Difference (95% CI)	Trending Noted
Ceftazidime-avibactam	*K. aerogenes*	0	0, (0)	0	0, (0)	0	n/a
	K. pneumoniae group	16	1, (6.3)	7	8, (50.0)	44%, (13%, 66%)	Yes
	M. morganii	1	`0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	P. vulgaris	0	0, (0)	0	0, (0)	0	n/a
Cefuroxime	*C. koseri*	17	4, (23.5)	13	0, (0)	-24%, (-47%, 0%)	No
Ciprofloxacin	*C. freundii* complex	1	0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	M. morganii	4	2, (50.0)	1	1, (25.0)	-25%, (-66%, 32%)	No
Gentamicin	*M. morganii*	25	8, (32.0)	7	10, (40.0)	8%, (-18%, 32%)	No
Levofloxacin	*M. morganii*	6	2, (33.3)	4	0, (0)	-33%, (-70%, -12%)	Yes
Meropenem	*K. aerogenes*	1	1, (100)	0	0, (0)	-100%, (-100%, 12%)	No
	K. oxytoca	7	1, (14.3)	3	3, (42.9)	29%, (-17%, 63%)	No
	K. pneumoniae group	24	9, (37.5)	7	8, (33.3)	-4%, (-29%, 22%	No
	M. morganii	5	3, (60.0)	0	2, (40.0)	-20%, (-60%, 32%)	No
Meropenem-vaborbactam	*M. morganii*	0	0, (0)	0	0, (0)	0	n/a
	P. vulgaris	0	0, (0)	0	0, (0)	0	n/a
Piperacillin-tazobactam	*A. baumannii* complex	27	6, (22.2)	14	7, (25.9)	4%, (-19%, 26%)	No
	C. freundii complex	13	3, (23.1)	6	4, (30.8)	8%, (-25%, 38%)	No
	E. coli	86	4, (4.7)	29	53, (61.6)	57%, (44%, 67%)	Yes
	K. aerogenes	21	3, (14.3)	6	12, (57.1)	43%, (14%, 63%)	Yes
	K. pneumoniae group	66	4, (6.1)	19	43, (65.2)	59%, (44%, 70%)	Yes
	M. morganii	4	3, (75.0)	1	0, (0)	-75%, (-95%, -9%)	Yes
Tobramycin	*K. aerogenes*	21	0, (0)	13	8, (38.1)	38%, (15%, 59%)	Yes
	K. oxytoca	43	12, (27.9)	9	22, (51.2)	23%, (3%, 41%)	No
	K. pneumoniae group	95	24, (25.3)	18	53, (55.8)	31%, (17%, 43%)	Yes
	P. vulgaris	17	7, (41.2)	9	1, (5.9)	-35%, (-59%, -7%)	Yes
	P. aeruginosa	56	4, (7.1)	31	21, (37.5)	30%, (15%, 44%)	Yes
Trimethoprim-sulfamethoxazole	*C. freundii* complex	0	0, (0)	0	0, (0)	0	n/a
	C. koseri	1	0, (0)	1	0, (0)	0%, (-79%, 79%)	No
	M. morganii	0	0, (0)	0	0, (0)	0	n/a

n/a- not applicable

2. Matrix Comparison:

Blood Culture Bottle Compatibility Study:
The ASTar BC G- Kit and ASTar Instrument compatibility with various blood culture bottles was previously assessed in K221688. Blood Culture Bottle Compatibility studies for the five new antimicrobials (cefotaxime, cefoxitin, ceftolozane-tazobactam, ceftriaxone, and ertapenem) added to the ASTar BC G- Kit were also performed following the study design described in the K221688 Decision Summary. Overall, results for all organisms with the new antimicrobials added to the ASTar BC G- Kit demonstrated acceptable performance with all tested blood culture bottles.

C Clinical Studies:

1. Clinical Sensitivity:

Not applicable.

2. Clinical Specificity:

Not applicable.

3. Clinical Cut-Off:

Not applicable.

4. Other Clinical Supportive Data (When 1. and 2. Are Not Applicable):

Not applicable.

D Expected Values/Reference Range:

Table 10: FDA-Recognized Interpretive Criteria

Antimicrobial	Organism	Minimum Inhibitory Concentrations* (µg/mL)[a]		
		Susceptible	Intermediate	Resistant
Amikacin	*Acinetobacter* spp.	≤8	16	≥32
	Enterobacterales	≤4	8	≥16
Ampicillin	Enterobacterales	≤8	16	≥32
Ampicillin-sulbactam	*Acinetobacter* spp.	≤8/4	16/8	≥32/16
	Enterobacterales	≤8/4	16/8	≥32/16
Aztreonam	Enterobacterales	≤4	8	≥16
	Pseudomonas aeruginosa	≤8	16	≥32
Cefazolin	Enterobacterales	≤2	4	≥8
Cefepime	Enterobacterales	≤2	4-8[b]	≥16
	Pseudomonas aeruginosa	≤8	16	≥32
Cefotaxime	Enterobacterales	≤1	2	≥4
Cefoxitin	Enterobacterales	≤4	8	≥16
Ceftazidime	*Acinetobacter* spp.	≤8	16	≥32
	Enterobacterales	≤4	8	≥16

Antimicrobial	Organism	Minimum Inhibitory Concentrations* (µg/mL)[a]		
		Susceptible	Intermediate	Resistant
	Pseudomonas aeruginosa	≤8	16	≥32
Ceftazidime-avibactam	Enterobacterales	≤8/4	-	≥16/4
	Pseudomonas aeruginosa	≤8/4	-	≥16/4
Ceftolozane-tazobactam	Enterobacterales	≤2/4	4/4	≥8/4
	Pseudomonas aeruginosa	≤4/4	8/4	≥16/4
Ceftriaxone	Enterobacterales	≤1	2	≥4
Cefuroxime	Enterobacterales	≤8	-	≥16
Ciprofloxacin	Enterobacterales	≤0.25	0.5	≥1
	Pseudomonas aeruginosa	≤0.5	1	≥2
Ertapenem	Enterobacterales	≤0.5	1	≥2
Gentamicin	Enterobacterales	≤2	4	≥8
Levofloxacin	Enterobacterales	≤0.5	1	≥2
	Pseudomonas aeruginosa	≤1	2	≥4
Meropenem	*Acinetobacter* spp.	≤2	4	≥8
	Enterobacterales	≤1	2	≥4
	Pseudomonas aeruginosa	≤2	4	≥8
Meropenem-vaborabactam	Enterobacterales	≤4/8	8/8	≥16/8
Piperacillin-tazobactam	*Acinetobacter* spp.	≤16/4	32/4-64/4	≥128/4
	Enterobacterales	≤8/4	16/4	≥32/4
Tigecycline	Enterobacterales	≤2	4	≥8
Tobramycin	Enterobacterales	≤2	4	≥8
	Pseudomonas aeruginosa	≤1	2	≥4
Trimethoprim-sulfamethoxazole	Enterobacterales	≤2/38	-	≥4/76

[a]According to FDA STIC Webpage, https://www.fda.gov/drugs/development-resources/fda-recognized-antimicrobial-susceptibility-test-interpretive-criteria

[b] SDD, susceptible-dose dependent

VIII Proposed Labeling:

The labeling supports the finding of substantial equivalence for this device.

IX Conclusion:

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