



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

I Background Information:

A 510(k) Number

K262163

B Applicant

Becton Dickinson and Company

C Proprietary and Established Names

BD BBL Mueller Hinton II Broth (Cation-Adjusted); BD Difco Mueller Hinton Broth

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
JTZ	Class II	21 CFR 866.1700 – Culture Medium for Antimicrobial Susceptibility Test	MI - Microbiology

II Submission/Device Overview:

A Purpose for Submission:

Obtain substantial equivalence for the following media formulations for Antimicrobial Susceptibility Testing (AST):

1. BD BBL Mueller Hinton II Broth (Cation-Adjusted) and
2. BD Difco Mueller Hinton Broth

B Measurand:

Antimicrobial Susceptibility Test

C Type of Test:

III Intended Use/Indications for Use:

A Intended Use(s):

See Indications for Use below.

B Indication(s) for Use:

BD BBL Mueller Hinton II Broth (Cation-Adjusted):

BD BBL Mueller Hinton II Broth (Cation-Adjusted) is intended for use in manual, quantitative procedures for susceptibility testing of rapidly-growing aerobic and facultatively anaerobic bacteria isolated from clinical specimens. It is formulated to have a low thymine and thymidine content and is adjusted to the calcium and magnesium ion concentrations recommended by the Clinical and Laboratory Standards Institute (CLSI). BD BBL Mueller Hinton II Broth (Cation-Adjusted) functions as an aid to diagnosis using pure culture isolates. BD BBL Mueller Hinton II Broth (Cation-Adjusted) is available as either a dehydrated culture medium, which is prepared as a broth prior to use, or as a ready-to-use broth.

BD Difco Mueller Hinton Broth:

BD Difco Mueller Hinton Broth, not cation-adjusted, is intended for use in manual, quantitative procedures for susceptibility testing of rapidly-growing aerobic and facultatively anaerobic bacteria isolated from clinical specimens as long as the calcium and magnesium ion concentrations are adjusted as recommended by the Clinical and Laboratory Standards Institute (CLSI). It is formulated to have a low thymine and thymidine content. BD Difco Mueller Hinton Broth functions as an aid to diagnosis using pure culture isolates. BD Difco Mueller Hinton Broth is available as a dehydrated culture medium which is prepared as a broth prior to use.

C Special Conditions for Use Statement(s):

Rx - For Prescription Use Only

D Special Instrument Requirements:

Not applicable

IV Device/System Characteristics:

A Device Description:

BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth are *in vitro* diagnostic culture media intended for use in manual, quantitative antimicrobial susceptibility testing (AST) of rapidly growing aerobic and facultatively anaerobic bacteria isolated from clinical specimens. The media are used in broth dilution methods for determination

of minimum inhibitory concentrations (MICs) of antimicrobial agents. This media is intended for use with pure culture isolates.

BD BBL Mueller Hinton II Broth (Cation-Adjusted) is available as a readymade liquid medium and as a dehydrated culture medium; BD Difco Mueller Hinton Broth is available as a dehydrated culture medium. The readymade format requires no preparation, while the dehydrated media are required to be reconstituted and autoclaved prior to use.

B Principle of Operation:

Mueller Hinton Broth is a nutritionally supportive medium designed for the growth of rapidly growing aerobic and facultative anaerobic bacteria and for use in broth dilution antimicrobial susceptibility testing. The medium contains beef extract and an acid hydrolysate of casein that provides essential nutrients required for bacterial growth. Starch acts as a protective colloid against toxic substances that may be present in the medium.

The media are formulated to have low thymine and thymidine content to minimize interference with the activity of certain antimicrobial agents and to support reliable MIC determinations. For BD BBL Mueller Hinton II Broth (Cation-Adjusted), calcium and magnesium ion concentrations are adjusted to provide the amounts recommended by CLSI M07 to ensure appropriate antimicrobial activity, particularly for agents affected by divalent cation concentrations. The pH of the prepared medium is adjusted in accordance with CLSI specifications.

In broth dilution antimicrobial susceptibility testing, antimicrobial agents are prepared in serial dilutions using Mueller Hinton Broth and inoculated with a standardized bacterial suspension. Following incubation at appropriate temperature, bacterial growth is assessed by visual observation of turbidity. The lowest concentration of antimicrobial agent that inhibits visible growth is determined as the minimum inhibitory concentration for the organism/agent combination.

V Substantial Equivalence Information:

A Predicate Device Name(s):

Mueller Hinton II Broth (Cation-Adjusted) with Lysed Horse Blood

B Predicate 510(k) Number(s):

K963036

C Comparison with Predicate(s):

Device & Predicate Device(s):	<u>K262163</u> (Proposed Devices)	<u>K963036</u> (Predicate)
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Device Trade Name	BD BBL Mueller Hinton II Broth (Cation-Adjusted)	BD Difco Mueller Hinton Broth	Mueller Hinton II Broth (Cation-Adjusted) with Lysed Horse Blood
General Device Characteristic Similarities			
Intended Use/ Indications for Use	BD BBL Mueller Hinton II Broth (Cation-Adjusted) is intended for use in manual, quantitative procedures for susceptibility testing of rapidly-growing aerobic and facultatively anaerobic bacteria isolated from clinical specimens. It is formulated to have a low thymine and thymidine content and is adjusted to the calcium and magnesium ion concentrations recommended by the Clinical and Laboratory Standards Institute (CLSI). BD BBL Mueller Hinton II Broth (Cation-Adjusted) functions as an aid to diagnosis using pure culture isolates. BD BBL Mueller Hinton II Broth (Cation-Adjusted) is available as either a dehydrated culture medium, which is prepared as a broth prior to use, or as a ready-to-use broth.	BD Difco Mueller Hinton Broth, not cation-adjusted, is intended for use in manual, quantitative procedures for susceptibility testing of rapidly-growing aerobic and facultatively anaerobic bacteria isolated from clinical specimens as long as the calcium and magnesium ion concentrations are adjusted as recommended by the Clinical and Laboratory Standards Institute (CLSI). It is formulated to have a low thymine and thymidine content. BD Difco Mueller Hinton Broth functions as an aid to diagnosis using pure culture isolates. BD Difco Mueller Hinton Broth is available as a dehydrated culture medium which is prepared as a broth prior to use.	Mueller Hinton II Broth (Cation-Adjusted) with Lysed Horse Blood (MHLHB) is intended for use in broth dilution antimicrobial susceptibility testing of <i>Streptococcus pneumoniae</i> with 11 antimicrobial agents; i.e., cefaclor, cefotaxime, ceftriaxone, cefuroxime, chloramphenicol, erythromycin, imipenem, penicillin, tetracycline, trimethoprim/sulfamethoxazole, and vancomycin, according to the protocol described in the Approved Standard M7-A3, "Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically - Third Edition", dated 12/93, published by the National Committee for Clinical Laboratory Standards (NCCLS).
Medium	Broth		Same
Inoculum	Pure culture colonies in a suspension equivalent to 0.5 McFarland		Same
Result Interpretation	Determination of MIC by visual observation of turbidity		Same
Result Type	Quantitative		Same
General Device Characteristic Differences			
Formulation	3.0 g beef extract, 17.5 g acid hydrolysate of casein, and 1.5 g starch, Ca ²⁺ and Mg ²⁺ adjusted to CLSI recommendations	2.0 g beef extract powder, 17.5 g acid digest of casein, and 1.5 g soluble starch	3.0 g beef extract, 17.5 g acid hydrolysate of casein, 1.5 g starch, and 30 mL Lysed Horse Blood, Ca ²⁺ and Mg ²⁺ adjusted to CLSI recommendations
Supply Form and Preparation	<u>Ready-to-use broth:</u> No additional preparation required prior to use OR Dehydrated Culture media:	Reconstituted, autoclaved, and cation adjusted prior to use	No additional preparation required prior to use

	Reconstituted and autoclaved prior to use		
Test organisms	Rapidly growing aerobic and facultatively anaerobic bacteria	<i>Streptococcus pneumoniae</i>	

VI Standards/Guidance Documents Referenced:

- CLSI M100-Ed35. *Performance Standards for Antimicrobial Susceptibility Testing* (January 2025).
- CLSI M07-Ed12. *Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically* (March 2024).

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

1. Precision/Reproducibility:

The performance of BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth was evaluated in a reproducibility study using five (5) CLSI-recommended quality control (QC) strains (*Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212, and *Staphylococcus aureus* ATCC 43300). Testing was performed in triplicate on three separate days using two media lots for a total of 54 datapoints per antimicrobial/organism combination. BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth were prepared, tested, and QC results were read and interpreted per CLSI M07 guidelines. Antimicrobial/organism combinations were included that evaluate media parameters, including cation concentrations. Colony counts were performed each day of testing to ensure the inoculum of each QC strain was prepared equivalent to a 0.5 McFarland standard.

Results were compared to the CLSI expected QC ranges listed in CLSI M100 and the percentage of results in range was calculated to determine the reproducibility by operator, media lot, and QC strain. The overall reproducibility was acceptable at 100% for BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth (**Table 1**).

Table 1. Reproducibility Results for BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth

Antimicrobial	Broth Dilution Range Tested (µg/mL)	CLSI QC Range (µg/mL)	BD BBL Mueller Hinton II (Cation-Adjusted) Results In Range (%)	BD Difco Mueller Hinton Broth Results In Range (%)
<i>E. coli</i> ATCC 25922				
Ampicillin	0.5-32	2-8	54/54 (100%)	54/54 (100%)
Cefotaxime	0.0075-0.5	0.03-0.12	54/54 (100%)	54/54 (100%)
Tigecycline	0.0075-1	0.03-0.25	54/54 (100%)	54/54 (100%)
<i>P. aeruginosa</i> ATCC 27853				

Ciprofloxacin	0.03-4	0.12-1	54/54 (100%)	54/54 (100%)
Gentamicin	0.125-8	0.5-2	54/54 (100%)	54/54 (100%)
Imipenem	0.25-16	1-4	54/54 (100%)	54/54 (100%)
Piperacillin-tazobactam	0.25/4-32/4	1/4-8/4	54/54 (100%)	54/54 (100%)
<i>S. aureus</i> ATCC 29213				
Clindamycin	0.015-1	0.06-0.25	54/54 (100%)	54/54 (100%)
Erythromycin	0.06-4	0.25-1	54/54 (100%)	54/54 (100%)
Oxacillin	0.03-2	0.12-0.5	54/54 (100%)	54/54 (100%)
Tetracycline	0.03-4	0.12-1	54/54 (100%)	54/54 (100%)
Vancomycin	0.125-8	0.5-2	54/54 (100%)	54/54 (100%)
<i>E. faecalis</i> ATCC 29212				
Ampicillin	0.125-8	0.5-2	54/54 (100%)	54/54 (100%)
Trimethoprim-sulfamethoxazole	0.125/2.375-2/38	≤0.5/9.5	54/54 (100%)	54/54 (100%)
Vancomycin	0.25-16	1-4	54/54 (100%)	54/54 (100%)
<i>S. aureus</i> ATCC 43300				
Oxacillin	1-16	≥4	54/54 (100%)	54/54 (100%)

2. Linearity:

Not applicable

3. Analytical Specificity/Interference:

Not applicable

4. Detection Limit and Assay Reportable Range:

Not applicable

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

Five (5) CLSI-recommended quality control strains, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212, and *Staphylococcus aureus* ATCC 43300, were included in the reproducibility study. Antimicrobials representing major drug classes relevant to each quality control strain were tested. The results of the study for each organism-antimicrobial combination were within acceptable range 100% of the time.

6. Assay Cut-Off:

Not applicable

B Comparison Studies:

1. Method Comparison with Predicate Device:

Device performance was evaluated in a reproducibility study described above.

2. Matrix Comparison:

Not applicable

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:

The CLSI-recommended quality control ranges for the antimicrobials and strains used in the reproducibility testing of BD BBL Mueller Hinton II Broth (Cation-Adjusted) and BD Difco Mueller Hinton Broth are listed in **Table 2**.

Table 2. CLSI Expected QC Ranges for Evaluated Antimicrobials and Strains

QC Strain	Antimicrobial	CLSI QC Range (µg/mL)
<i>E. coli</i> ATCC 25922	Ampicillin	2-8
	Cefotaxime	0.03-0.12
	Tigecycline	0.03-0.25
<i>P. aeruginosa</i> ATCC 27853	Ciprofloxacin	0.12-1
	Gentamicin	0.5-2
	Imipenem	1-4
	Piperacillin-tazobactam	1/4-8-4
<i>S. aureus</i> ATCC 29213	Clindamycin	0.06-0.25
	Erythromycin	0.25-1
	Oxacillin	0.12-0.5
	Tetracycline	0.12-1
	Vancomycin	0.5-2
	Ampicillin	0.5-2

<i>E. faecalis</i> ATCC 29212	Trimethoprim-sulfamethoxazole	$\leq 0.5/9.5$
	Vancomycin	1-4
<i>S. aureus</i> ATCC 43300	Oxacillin	≥ 4

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.