



**BD BBL™ Bacteroides Bile Esculin Agar (BBE) and  
BD BBL™ CDC Anaerobe Laked Sheep Blood Agar with KV - BD I Plate™**  
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**QUALITY CONTROL PROCEDURES**

R<sub>x</sub> Only

**I INTRODUCTION**

**BD BBL™ Bacteroides Bile Esculin (BBE) Agar** is used as a primary isolation medium for the selection and presumptive identification of the *B. fragilis* group.

**BD BBL™ CDC Anaerobe Laked Sheep Blood Agar with Kanomycin and Vancomycin (KV)** is an enriched, selective culture medium for the selective isolation of obligately anaerobic gram-negative bacilli from clinical and nonclinical materials.

**II PERFORMANCE TEST PROCEDURE**

**A. BD BBL Bacteroides Bile Esculin Agar**

1. Reduce all plates overnight at room temperature in a **BD GasPak™ EZ** anaerobic system.
2. Inoculate representative samples with the cultures listed below.
  - a. For obligate anaerobes, streak inoculate with 1 µL (0.001 mL) from a 48–72 h culture of Chopped Meat Broth that has incubated for 2 days at 35–37 °C.
  - b. For *E. coli* and *P. mirabilis* streak inoculate with 1 µL (0.001 mL) from a 4–5 h culture of **BD BBL™ Trypticase™** Soy Broth.
  - c. Incubate plates at 36 ± 1 °C in an anaerobic atmosphere.
  - d. Include plates of a previously tested lot of TSA with 5% Sheep Blood as controls for all strains.
3. Examine plates after 48 h for growth, esculin hydrolysis and selectivity.
4. Expected Results

Organisms	ATCC®	Recovery	Esculin Reaction
* <i>Bacteroides fragilis</i>	25285	Fair to heavy growth	+ (blackening)
<i>Bacteroides ovatus</i>	8483	Fair to heavy growth	+ (blackening)
<i>Bacteroides thetaiotaomicron</i>	29741	Fair to heavy growth	+ (blackening)
* <i>Bacteroides vulgatus</i>	8482	Fair to heavy growth	+/- (may or may not produce blackening)
* <i>Clostridium perfringens</i>	13124	No growth	N/A
<i>Escherichia coli</i>	25922	No growth to trace growth	N/A
* <i>Proteus mirabilis</i>	12453	No growth to trace growth	N/A

\*Recommended organism strain for User Quality Control.

**NOTE:** This medium is exempt from User QC testing according to CLSI M22-A3.

**B. BD BBL CDC Anaerobe Laked Sheep Blood Agar with KV**

1. Inoculate representative samples with the cultures listed below.
  - a. For obligate anaerobes, streak inoculate with 1,000–10,000 CFU from a 0.5 McFarland standard Enriched Thioglycollate Medium (ETM) with Vitamin K<sub>1</sub> and Hemin. Use a 48–120 h CDC Anaerobe with 5% Sheep Blood culture to inoculate the ETM.
  - b. For *E. coli* and *S. aureus*, use a 1:10 dilution of an 18–24 h **BD BBL Trypticase** Soy Broth culture.
  - c. For *P. mirabilis* use a 1:1000 dilution of an 18–24 h **BD BBL Trypticase** Soy Broth culture.
  - d. Incubate plates at 36 ± 1 °C in an anaerobic atmosphere.
  - e. Include plates of a previously tested lot of TSA with 5% Sheep Blood as controls for all strains.
2. Examine plates after 48 h for growth, color formation, fluorescence and selectivity.
3. Expected Results

Organisms	ATCC	Recovery	Colony Color	Fluorescence†
* <i>Bacteroides fragilis</i>	25285	Moderate to heavy growth	Gray	–
<i>Porphyromonas levii</i>	29147	Moderate to heavy growth	Tan to brown-black	+
* <i>Clostridium perfringens</i>	13124	No growth	N/A	–
* <i>Fusobacterium mortiferum</i>	25557	Fair to heavy growth	Off-white to yellow-tan	–
<i>Porphyromonas asaccharolytica</i>	25260	Moderate to heavy growth	Brown-black	+
<i>Escherichia coli</i>	25922	No growth to trace growth	Gray	–
* <i>Proteus mirabilis</i>	12453	Inhibited	Light gray	–
<i>Staphylococcus aureus</i>	25923	No growth	N/A	N/A

\*Recommended organism strain for User Quality Control.

†Examine colonies on the CDC media with a long-wave (365 nm) UV lamp. Colonies of the pigmenting *Porphyromonas-Prevotella* species should fluoresce orange to brick red under UV light. Fluorescence is visible before pigmentation. Fluorescence is seen only in young colonies. Pigment develops slowly and may obscure fluorescence.

**NOTE:** This medium is exempt from User QC testing according to CLSI M22-A3. However, monitoring of exempt media used for anaerobes is strongly recommended.

### III ADDITIONAL QUALITY CONTROL

1. Examine plates as described under "Product Deterioration."
2. Visually examine representative plates to assure that any existing physical defects will not interfere with use.
3. Determine the pH potentiometrically at room temperature for adherence to the specification of  $7.0 \pm 0.2$  (**BD BBL Bacteroides Bile Esculin Agar**) and  $7.5 \pm 0.2$  (**BD BBL CDC Anaerobe Laked Sheep Blood Agar with KV**).
4. Note the firmness of plates during the inoculation procedure.
5. Incubate uninoculated representative plates at  $35 \pm 2$  °C for 72 h and examine for microbial contamination.

### PRODUCT INFORMATION

### IV INTENDED USE

These media are used in qualitative procedures for the isolation and cultivation of obligately anaerobic microorganisms from clinical and nonclinical specimens.

These media in two-sectored **BD I Plate™** dishes offer the ability to utilize the properties of the two media in one plate.

### V SUMMARY AND EXPLANATION

The members of the *Bacteroides fragilis* group are among the most frequently encountered anaerobes in human clinical infections. Rapid detection and identification of these organisms is important, since they tend to be more resistant to antimicrobial therapy than other anaerobes.<sup>1,2</sup> *B. fragilis* and *B. thetaiotaomicron* are the species of greatest clinical significance.<sup>1</sup> Other species in the group are: *B. caccae*, *B. distasonis*, *B. eggerthii*, *B. merdae*, *B. ovatus*, *B. stercoris*, *B. uniformis* and *B. vulgatus*.

BBE was developed by Livingston et al. as a primary plating medium.<sup>3</sup> This medium provides selective recovery of the *B. fragilis* group and also evidence for presumptive identification based on esculin hydrolysis.<sup>3</sup>

CDC Anaerobe Blood Agar was developed at the Centers for Disease Control and Prevention as a nonselective medium for the isolation and cultivation of a wide variety of obligately anaerobic microorganisms, particularly those found in clinical materials.<sup>4,5</sup>

The addition of the antimicrobial agents kanamycin and vancomycin enables the selective isolation of gram-negative, nonsporeforming anaerobic bacilli, particularly *Porphyromonas* and *Prevotella* species.<sup>4,6</sup>

**BD BBL CDC Anaerobe Laked Sheep Blood Agar with KV** consists of CDC Anaerobe Blood Agar base supplemented with laked sheep blood, kanamycin and vancomycin.

### VI PRINCIPLES OF THE PROCEDURE

BBE is a primary plating medium for the selective isolation and presumptive identification of the *B. fragilis* group. Selective inhibition of facultative anaerobes and most gram-negative anaerobes is obtained by the presence of gentamicin and oxgall.<sup>1,7</sup>

Differentiation of the *B. fragilis* group is based on esculin hydrolysis. Hydrolysis of the esculin by members of the *B. fragilis* group produces esculetin and glucose. The esculetin reacts with the iron salt contained in the medium to produce a dark brown to black complex that appears as zones around the colonies of organisms that hydrolyze esculin.

CDC Anaerobe 5% Sheep Blood Agar consists of **BD BBL Trypticase Soy Agar** enriched with yeast extract to supply vitamins, amino acids and other essential nutrients. The medium is further enriched with hemin and vitamin K<sub>1</sub> to supply nutrients that are required by some strains of the pigmenting *Porphyromonas-Prevotella* (formerly *Bacteroides*) species and are reported to enhance the growth of some other species and some gram-positive nonsporeforming anaerobes.<sup>5,8,9</sup> Defibrinated sheep blood is added to supply nutrients and for the determination of hemolytic reactions and pigmentation. The use of laked blood improves the pigmentation of the *Prevotella* and *Porphyromonas* species.<sup>6</sup>

Kanamycin and vancomycin inhibit most gram-positive facultative and obligate anaerobic microorganisms.<sup>7</sup>

### VII REAGENTS

#### BD BBL Bacteroides Bile Esculin Agar (BBE)

Approximate Formula\* Per Liter Purified Water

Pancreatic Digest of Casein .....	14.5 g	Hemin .....	0.01 g
Papaic Digest of Soybean Meal .....	5.0 g	Gentamicin .....	0.1 g
Sodium Chloride .....	5.0 g	Vitamin K1 .....	0.01 g
Esculin .....	1.0 g	Agar .....	14.0 g
Ferric Ammonium Citrate .....	0.5 g	Growth Factors .....	1.8 g
Oxgall .....	15.0 g		

\*Adjusted and/or supplemented as required to meet performance criteria.

#### CDC Anaerobe 5% Sheep Blood Agar

Approximate Formula\* Per Liter Purified Water

Pancreatic Digest of Casein .....	15.0 g	Hemin .....	0.005 g
Papaic Digest of Soybean Meal .....	5.0 g	Vitamin K1 .....	0.01 g
Sodium Chloride .....	5.0 g	L-Cystine .....	0.4 g
Agar .....	20.0 g	Sheep Blood, defibrinated .....	5%
Yeast Extract .....	5.0 g		

\*Adjusted and/or supplemented as required to meet performance criteria.

**BD BBL CDC Anaerobe Laked Sheep Blood Agar with KV** consists of CDC Anaerobe Blood Agar base with 5% laked defibrinated sheep blood, 100.0 mg/L kanamycin and 7.5 mg/L vancomycin.

**Warnings and Precautions:** For *in vitro* Diagnostic Use.

If excessive moisture is observed, invert the bottom over an off-set lid and allow to air dry in order to prevent formation of a seal between the top and bottom of the plate during incubation.

**Storage Instructions:** On receipt, store plates in the dark at 2–8 °C. Avoid freezing and overheating. Do not open until ready to use.

Minimize exposure to light. Prepared plates stored in their original sleeve wrapping at 2–8 °C until just prior to use may be inoculated up to the expiration date and incubated for recommended incubation times. Allow the medium to warm to room temperature before inoculation.

**Product Deterioration:** Do not use plates if they show evidence of microbial contamination, discoloration, drying, cracking or other signs of deterioration.

## VIII SPECIMEN COLLECTION AND HANDLING

Refer to appropriate texts for details of specimen collection and handling procedures.<sup>1,2,5,10,11</sup>

Observe established precautions against microbiological hazards throughout all procedures. All specimens should be handled according to CDC-NIH recommendations, CLSI guidelines or local institution guidelines for any potentially infectious human serum, blood or other body fluids. Prior to discarding, sterilize specimen containers and other contaminated materials by autoclaving.

## IX PROCEDURE

**Material Provided: BD BBL Bacteroides Bile Esculin Agar // BD BBL CDC Anaerobe Laked Sheep Blood Agar with KV - BD I Plate**

**Materials Required But Not Provided:** Ancillary culture media, reagents, quality control organisms and laboratory equipment as required.

**Test Procedure:** Observe aseptic techniques.

The agar surface should be smooth and moist, but without excessive moisture.

These media should be reduced immediately prior to inoculation by placing them under anaerobic conditions for 6–24 h.<sup>12</sup>

Inoculate the medium as soon as possible after the specimen arrives at the laboratory. To culture a specimen from a swab, inoculate the medium by rolling the swab over a third of the agar surface, and streak the remainder of the plate to obtain isolated colonies. Material not being cultured from swabs should be streaked onto the medium with a sterilized inoculating loop. The streak plate technique is used primarily to obtain isolated colonies from specimens containing mixed flora.

Inoculate an enrichment broth, such as Enriched Thioglycollate Medium, at the same time as the primary plates to detect small numbers of anaerobes.

Incubate plates and tubes immediately after inoculation, with plates in an inverted position (agar side up), under anaerobic conditions at  $35 \pm 2^\circ\text{C}$ , or place the media in a holding jar flushed with oxygen free gas(es) until a sufficient number of plates and tubes is accumulated (no longer than 3 h).<sup>13</sup> Incubate for at least 48 h, and, if no growth occurs, continue incubation for up to 7 days. An indicator should be used to detect anaerobiosis.

Examine for growth after 48 h of incubation. Cultures should not be regarded as negative until after 7 days of incubation.

**User Quality Control:** See “Quality Control Procedures.”

Quality control requirements must be performed in accordance with applicable local, state and/or federal regulations or accreditation requirements and your laboratory's standard Quality Control procedures. It is recommended that the user refer to pertinent CLSI guidance and CLIA regulations for appropriate Quality Control practices.

## X RESULTS

After a minimum of 48 h of incubation, the plates should show isolated colonies in streaked areas and confluent growth in areas of heavy inoculation.

Growth in liquid media is indicated by the presence of turbidity compared with an uninoculated control.

Isolates of the *B. fragilis* group cultured on BBE should be greater than 1 mm in diameter and appear gray, circular, entire and raised. Esculin hydrolysis is indicated by a blackening of the medium around the colonies.

Note: If the plates are to be examined after 24 h, examine quickly and reincubate under anaerobic conditions.

Examine colonies on the CDC medium using a dissecting microscope and with a long-wave UV lamp. Colonies of the pigmented *Porphyromonas-Prevotella* species should fluoresce orange to brick red under UV light. Fluorescence is visible before pigmentation.

In order to determine the relationship to oxygen of each colony type present on anaerobic solid media, follow established procedures.<sup>12</sup> Those colony types that prove to contain obligate anaerobes can be further studied using appropriate identification methods.<sup>1,2,10,11,14-17</sup>

## XI LIMITATIONS OF THE PROCEDURE

These prepared plated media are intended for primary isolation. Some diagnostic tests may be performed with the primary plate.

*B. vulgatus* may not hydrolyze esculin.<sup>1</sup>

The concentration of vancomycin (7.5 µg/mL) may be inhibitory to asaccharolytic *Porphyromonas* species.<sup>1</sup>

For identification, organisms must be in pure culture. Morphological, biochemical and/or serological tests should be performed for final identification. Consult appropriate texts for detailed information and recommended procedures.<sup>1,2,10,11,14-17</sup>

A single medium is rarely adequate for detecting all organisms of potential significance in a specimen. The agents in selective media may inhibit some strains of the desired species or permit the growth of a species they were designed to inhibit, especially if the species is present in large numbers in the specimen. Cultures of specimens grown on selective media should, therefore, be compared with specimens cultured on nonselective media to obtain additional information and help ensure recovery of potential pathogens.

## XII AVAILABILITY

Cat. No.	Description
297260	<b>BD BBL™</b> BBE // CDC Anaerobe Laked Sheep Blood Agar with KV, Ctn. of 100 plates
297022	<b>BD BBL™</b> BBE // CDC Anaerobe Laked Sheep Blood Agar with KV, Ctn. of 20 plates

### XIII REFERENCES

1. Jousimies-Somer, H.R., and S.M. Finegold. 1991. Anaerobic gram-negative bacilli and cocci, p. 538-533. In A. Balows, W.J. Hausler, Jr., K.L. Herrmann, H.D. Isenberg, and H.J. Shadomy (ed.), Manual of clinical microbiology, 5th ed. American Society for Microbiology, Washington, D.C.
2. Rodloff, A.C., P.C. Appelbaum, and R.J. Zabransky. 1991. Cumitech 5A, Practical anaerobic bacteriology. Coordinating ed., A.C. Rodloff. American Society for Microbiology, Washington D.C.
3. Livingston, S.J., S.D. Kominos, and R.B. Yee. 1978. New medium for selection and presumptive identification of the *Bacteroides fragilis* group. J. Clin. Microbiol. 7:448-453.
4. Dowell, V.R., Jr., G.L. Lombard, F.S. Thompson, and A.Y. Armfield. 1977. Media for isolation, characterization, and identification of obligately anaerobic bacteria. CDC laboratory manual. Center for Disease Control, Atlanta.
5. Murray, P.R., and D.M. Citron. 1991. General processing of specimens for anaerobic bacteria, p. 488-504. In A. Balows, W.J. Hausler, Jr., K.L. Herrmann, H.D. Isenberg, and H.J. Shadomy (ed.), Manual of clinical microbiology, 5th ed. American Society for Microbiology, Washington D.C.
6. Finegold, S.M., A.B. Miller, and D.J. Posnick. 1965. Further studies on selective media for *Bacteroides* and other anaerobes. Ernahrungsforschung 10:517-528.
7. MacFaddin, J.F. 1985. Media for isolation-cultivation-identification-maintenance of medical bacteria. vol 1. Williams & Wilkins, Baltimore.
8. Gibbons, R.J., and J.B. MacDonald. 1960. Hemin and vitamin K compounds as required factors for the cultivation of certain strains of *Bacteroides melaninogenicus*. J. Bacteriol. 80:164-170.
9. Wilkins, T.D., S.L. Chalgren, F. Jimenez-Ulate, C.R. Drake, Jr., and J.L. Johnson. 1976. Inhibition of *Bacteroides fragilis* on blood agar plates and reversal of inhibition by added hemin. J. Clin. Microbiol. 3:359-363.
10. Engelkirk, P.G., J. Duben-Englekirk, and V.R. Dowell, Jr. 1992. Principles and practice of clinical anaerobic bacteriology. Star Publishing Co., Belmont Calif.
11. Summanen, P., E.J. Baron, D.M. Citron, C.A. Strong, H.M. Wexler, and S.M. Finegold. 1993. Wadsworth anaerobic bacteriology manual, 5th ed. Star Publishing Co., Belmont Calif.
12. Allen, S.D., J.A. Siders, and L.M. Marler. 1985. Isolation and examination of anaerobic bacteria, pp. 413-433. In E.H. Lennette, A. Balows, W.J. Hausler, Jr., and H.J. Shadomy (ed.), Manual of clinical microbiology, 4th ed. American Society for Microbiology, Washington D.C.
13. Martin, W.J. 1971. Practical method for isolation of anaerobic bacteria in the clinical laboratory. Appl. Microbiol. 22:1168-1171.
14. Holdeman, L.V., E.P. Cato, and W.E.C. Moore (ed.). 1977. Anaerobe laboratory manual, 4th ed. Virginia Polytechnic Institute and State University, Blacksburg.
15. Isenberg, H.D. (ed.). 1992. Clinical Microbiology procedures handbook, vol. 1. American Society for Microbiology, Washington, D.C.
16. Holt, J.G., N.R. Krieg, P.H.A. Sneath, J.T. Staley, and S.T. Williams (ed.). 1994. Bergey's Manual of determinative bacteriology, 9th ed. Williams & Wilkins, Baltimore.
17. Jousimies-Somer, H.R., P.H. Summanen, and S.M. Finegold. 1995. *Bacteroides*, *Porphyromonas*, *Prevotella*, *Fusobacterium*, and other anaerobic gram-negative bacteria, p. 603-620. In P.R. Murray, E.J. Baron, M.A. Pfaller, F.C. Tenover, and R.H. Tenover (ed.), Manual of clinical microbiology, 6th ed. American Society for Microbiology, Washington, D.C.

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