Technical Information

Bile Esculin Azide Agar

Product Code: DM 1493

Application: Bile Esculin Azide Agar is a selective medium used for isolation and presumptive identification of faecal Streptococci.

Composition**

Ingredients	Gms / Litre
Casein enzymic hydrolysate	17.000
Beef extract	5.000
Proteose peptone	3.000
Oxgall	10.000
Esculin	1.000
Ferric ammonium citrate	0.500
Sodium chloride	5.000
Sodium azide	0.150
Agar	15.000
Final pH (at 25°C)	7.1±0.2

**Formula adjusted, standardized to suit performance parameters

Principle & Interpretation

Group D Streptococci contains the group D lipoteichoic acid antigen in their cell walls are predominant normal inhabitants of the human gastrointestinal tract, are termed as faecal Streptococci or Enterococci [1]. The unique ability of Enterococci to split esculin was reported by Meyer and Schonfeld [2]. Enterococci and Group D Streptococci hydrolyse esculin to esculetin and dextrose, which reacts with ferric citrate producing brownish black precipitate [3]. The use of esculin hydrolysis in identification of Enterococci was first reporter by Rochaix [4]. Bile Esculin Agar was originally formulated by Swan [6] for the isolation and identification of Group D Streptococci from food. Facklam and Moody [7,8] further reported that using Bile Esculin Agar, Group D Streptococci could be differentiated from non Group D Streptococci. Bile Esculin Agar was also shown to help in differentiation of *Enterobacteriaceae, Klebsiella, Enterobacter, Serratia* from other Enterobacteriaceae genera [9] on the basis of esculin hydrolysis. However, other tests such as salt tolerance should be performed for identifying Enterococci [5].

Bile Esculin Azide Agar is a modification of Bile Esculin Agar [6-8] as per Isenberg [10]. In this medium the bile concentration is reduced and additional sodium azide is incorporated. Casein enzymic hydrolysate, proteose peptone and beef extract serves as sources of carbon, nitrogen, amino acids, vitamins and essential growth nutrients. Oxgall and sodium azide inhibits most of the other accompyning bacteria. Esculin in the medium is hydrolyzed to esculetin and dextrose. Esculetin reacts with ferric citrate to form a dark brown or black complex, visualized as a zone of black precipitate around the colonies. If the media is dispensed in tubes in the form of slants, a positive reaction is indicated by blackening of more than half of the slant within 24-48 hours. If blackening is totally absent or if less than half of the slant is blackened within 24-48 hours, the test is negative. Viridans Streptococci sometimes exhibit a weak positive reaction. Also, *Leuconostoc, Pediococcus, Lactococcus* species causing human infections give a positive bile esculin test [11]. To enhance the growth of Enterococci, Bile Esculin Agar can be supplemented with 50ml/l horse serum [3].

Suspected water samples are filtered using membrane filters. These membrane filters are aseptically placed on Slanetz and Bartely Medium (DM1612I). Red or maroon coloured colonies observed after incubation are further confirmed by aseptically transferring the membrane filter on to Bile Esculin Azide Agar plate preheated to 44°C. Incubation at 44 ± 0.5°C for 2 hours is done following the inoculation. All typical colonies exhibiting a brown black colouration in the surrounding medium are counted as intestinal Enterococci [11].
Alternatively Bile Esculin Azide Agar can also be used for direct isolation of Enterococci (without membrane filter), by incubation at 35-37°C for 18-24 hours.

Methodology

Suspend 56.65 grams of powder media in 1000 ml distilled water. Shake well and heat to dissolve the medium completely. Sterilize by autoclaving at 15 lbs pressure (12 1°C) for 15 minutes.

Caution: Sodium azide has a tendency to form explosive metal azides with plumbing materials. It is advisable to use enough water to flush off the disposables.

Quality Control

Physical Appearance

Cream to yellow homogeneous free flowing powder

Gelling

Firm, comparable with 1.5% Agar gel

Colour and Clarity of prepared medium

Amber coloured, clear to slightly opalescent gel with a bluish tinge forms in Petri plates.

Reaction

Reaction of 5.67% w/v aqueous solution at 25°C. pH : 7.1±0.2

pH Range 6.90-7.30

CulturalResponse/Characteristics

DM: 1493 Cultural characteristics observed after an incubation at 35-37°C for 18-24 hours.

Organism	Inoculum (CFU)	Growth	Recovery	Esculin Hydrolysis
Enterococcus faecalis ATCC 29212	50-100	Luxuriant	>=50%	Positive reaction, blackening of medium around the colony
Escherichia coli ATCC25922	>=10^3	Inhibited	0%	
Staphylococcus aureus ATCC 25923	50-100	Good	40-50%	negative reaction
Proteus mirabilis ATCC 25933	50-100	Good	40-50%	negative reaction
Streptococcus pyogenes ATCC 19615	50-100	none-poor	<=10%	negative reaction

Storage and Shelf Life

Dried Media: Store below 30°C in tightly closed container and use before expiry date as mentioned on the label.
Prepared Media: 2-8^0 in sealable plastic bags for 2-5 days

Further Reading

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4. Rochaix, 1924, Comt. Rend. Soc. Biol., 90:771.
5. Facklam R., 1973, Appl. Microbiol., 26:138.
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10. Murray P. R., Baron E. J., Jorgensen J. H., Pfaller M. A., Yolken R. H.,(Eds.), 8th Ed., 2003, Manual of Clinical Microbiology, ASM, Washington, D.C.

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