

MR-VP Medium (Glucose Phosphate Broth)**M070I**

MR-VP Medium (Glucose Phosphate Broth) is recommended for the performance of the Methyl Red and Voges-Proskauer tests in differentiation of the coli-aerogenes group.

Composition**

Ingredients	Gms / Litre
Peptone	7.000
Dextrose	5.000
Dipotassium phosphate	5.000
Final pH (at 25°C)	6.9±0.2

**Formula adjusted, standardized to suit performance parameters

Directions

Suspend 17 grams in 1000 ml of distilled water. Heat if necessary to dissolve the medium completely. Distribute in test tubes in 10 ml amounts and sterilize by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

Principle And Interpretation

Methyl Red and Voges-Proskauer test are among the two various tests used in the biochemical identification of bacterial species. These tests were originally studied by Voges, Proskauer (1) and subsequently by Clark and Lubs (2) to differentiate between members of the coli- aerogens group. Both the tests are based on the detection of specific breakdown products of carbohydrate metabolism.

All members of *Enterobacteriaceae* are, by definition, glucose fermenters. In MR-VP Broth, after 18-24 hours of incubation, fermentation produces acidic metabolic byproducts. Therefore initially all enterics will give a positive MR reaction if tested (3, 4, 5). However, after further incubation, required by the test procedure (2-5 days), MR - positive organisms continue to produce acids, resulting in a low pH (acidic) that overcomes the phosphate buffering system and maintains an acidic environment in the medium (pH 4.2 or less). MR-negative organisms further metabolize the initial fermentation products by decarboxylation to produce neutral acetyl methylcarbinol (acetoin), which results in decreased acidity in the medium and raises the pH towards neutrality (pH 6.0 or above) (6). In the presence of atmospheric oxygen and alkali, the neutral end products, acetoin and 2, 3-butanediol, are oxidized to diacetyl, which react with creatine to produce a red colour. MR-VP Broth (M070I) has also been recommended by the ISO committee (7) for detection of the coli-aerogenes group.

The Methyl Red (MR) test is performed after 5 days of incubation at 30°C (8). The Voges-Proskauer test (VP) cultures are incubated at 30°C for 24-48 hours (9). Various test procedures have been suggested for performing the VP test by Werkman (10), OMeara (11) Levine, et al (12) and Voughn et al (8).

Werkmans Test (10): Add 2 drops of a 2% solution of ferric chloride to 50 ml culture and 5 ml of 10% sodium hydroxide. Shake the tube to mix well. Stable copper colour developing in a few minutes is positive reaction.

OMeara Test (11): Add 25 mg of solid creatine to 5 ml culture and then add 5 ml concentrated (40%) sodium hydroxide. Red colour development in a few minutes after shaking the tube well is a positive reaction.

Levine, Epstein and Voughn (12) modified OMeara technique by dissolving the creatine in a concentrated solution of potassium hydroxide (R031, OMeara Reagent). Voughn, Mitchell and Levine (8) recommended the method of Barritt (13) as, addition of 1 ml of Barritt Reagent B (R030 - 40% potassium hydroxide) and 3 ml of Barritt Reagent A (R029 - 5% a-naphthol in absolute ethanol) to 5 ml culture. Positive test is indicated by eosin pink colour within 2-5 minutes.

The MR and VP tests should not be relied upon as the only means of differentiating *E. coli* from the *Klebsiella-Enterobacter* groups. Also occasionally a known acetoin-positive organism fails to give a positive VP reaction. To overcome this possibility, gently heat the culture containing the VP reagents (14).

Quality Control**Appearance**

Cream to yellow homogeneous free flowing powder

Colour and Clarity of prepared medium

Light yellow coloured clear solution without any precipitate

Reaction

Reaction of 1.7% w/v aqueous solution at 25°C. pH : 6.9±0.2

Cultural Response

M0701: Cultural characteristics observed after an incubation at 30-32°C for 18-48 hours.

Organism	Inoculum (CFU)	Growth	MR Test	VP Test		
<i>Escherichia coli</i> ATCC 25922	50-100	luxuriant	positive reaction, bright red colour	negative reaction		
<i>Enterobacter aerogenes</i> ATCC 13048	50-100	luxuriant	negative reaction	positive reaction, eosin pink / red colour within 2-5 minutes		
<i>Klebsiella pneumoniae</i> ATCC 23357	50-100	luxuriant	negative reaction	positive reaction, eosin pink / red colour within 2-5 minutes		

Reference

1. Voges O. and Proskauer B., 1898, Z. Hyg. Infektionskr., 28:20.
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3. Barry A. L., Bernsohn K. L., Adams A. B., Thrup L. D., Appl. Microbiol., 1970, 20 (6), 866-870.
4. Branson D., Methods in Clinical Bacteriology, Springfield, IL: Charles C Thomas, 1972, 32-33.
5. Cowan S. T., Cowan and Stuls Manual for the Identification of Medical Bacteria, 2nd Ed., Cambridge, Cambridge University Press, 1974, 37,48.
6. MacFaddin J. F., 2000, Biochemical tests for Identification of Medical Bacteria, 3rd Ed., Lippincott, Williams and Wilkins, Baltimore.
7. International Organization for Standardization (ISO), 2002, Draft ISO/DIS 6597.
8. Vaughn R. H., Mitchell N. B. and Levine M., 1939, J. Am. Water Works Association, 31:993.
9. Ruchhoft C. C., Kallas J. G., Chinn B. and Coulter E. W., 1931, J. Bacteriol., 22 : 125.
10. Werkman C. H., 1930, J. Bact., 20: 121.
11. OMeara R. A. Q., 1931, J. Path. Bacteriol., 34 : 401.
12. Levine M., Epstein S. S. and Vaughn R. H., 1934, Am. J. Publ. Health, 24: 505.
13. Ewing W. H., 1986, Edwards and Ewings Identification of Enterobacteriaceae, 4th Ed., Elsevier Science Publishing Co., Inc., New York.
14. MacFaddin J. F., 1985, Media for Isolation-Cultivation-Identification-Maintenance of Medical Bacteria, Vol. 1, Williams and Wilkins, Baltimore.

Storage and Shelf Life

Store below 30°C and the prepared medium at 2 - 8°C. Use before expiry date on the label.