# MACCONKEY AGAR w/ MUG

## INTENDED USE
Remel MacConkey Agar w/ MUG is a solid medium recommended for use in qualitative procedures for the rapid presumptive identification of *Escherichia coli*.

## SUMMARY AND EXPLANATION
In 1973, Dahlen and Linde developed a plated medium containing the enzyme substrate 4-methylumbelliferyl-β-D-glucuronide (MUG) to screen for glucuronidase activity in enteric gram-negative bacilli.[1] In 1976, Kilian and Bulow developed a method to identify bacterial glycosidases for rapid identification of *Enterobacteriaceae*.[2] Edberg and Trepeta described a one-hour method for identifying *E. coli* using oxidase, indole, lactose, and β-glucuronidase tests.[3] In further testing, β-glucuronidase was incorporated into MacConkey Agar to reduce the time required for identification of MUG-positive enteric gram-negative bacilli.[4] β-glucuronidase activity was detected directly on the primary isolation agar using a longwave ultraviolet light to detect fluorescence.

## PRINCIPLE
Peptones provide nitrogenous nutrients and amino acids necessary for bacterial growth. Bile salts and crystal violet are selective agents which inhibit gram-positive organisms. Crystal violet restricts the swarming of *Proteus*, however, occasional strains may swarm. Sodium chloride maintains osmotic equilibrium. MacConkey Agar is differential due to the combination of lactose and neutral red, an indicator. Lactose-fermenters form pink colonies surrounded by a zone of precipitated bile. Nonlactose-fermenters, such as *Salmonella* and *Shigella*, form colorless, translucent colonies. MUG is added to facilitate detection of *E. coli* which produces the enzyme, β-glucuronidase. In the presence of MUG, β-glucuronidase releases a highly fluorescent compound called 4-methylumbelliferone which fluoresces blue-green when observed with a longwave ultraviolet light.

## REAGENTS (CLASSICAL FORMULA)*

| | | | | | |
|---|---|---|---|---|---|
| Gelatin Peptone | 17.0 | g | Meat Peptone | 1.5 | g |
| Lactose | 10.0 | g | 4-methylumbelliferyl-β-D-glucuronide (MUG) | 0.1 | g |
| Sodium Chloride | 5.0 | g | Neutral Red | 30.0 | mg |
| Bile Salts | 1.5 | g | Crystal Violet | 1.0 | mg |
| Casein Peptone | 1.5 | g | Agar | 13.5 | g |
| | | | Demineralized Water | 1000.0 | ml |

pH 7.1 ± 0.2 @ 25°C

*Adjusted as required to meet performance standards.

## PRECAUTIONS
This product is For Laboratory Use only. It is not intended for use in the diagnosis of disease or other conditions.

## PREPARATION OF DEHYDRATED CULTURE MEDIUM
1. Suspend 50 g of medium in 1000 ml of demineralized water.
2. Heat to boiling with agitation to completely dissolve.
3. Sterilize by autoclaving at 121°C for 15 minutes or following established laboratory procedures.
4. Dispense into appropriate containers.

## PROCEDURE
1. Consult current editions of appropriate references for the recommended procedure for sample preparation, inoculation, testing, and interpretation.

## QUALITY CONTROL
Each lot number of MacConkey Agar w/ MUG has been manufactured, packaged, and processed in accordance with current Good Manufacturing Practice regulations. All lot numbers have been tested using the following quality control organisms and have been found to be acceptable. Testing of control organisms should be performed in accordance with established laboratory quality control procedures. If aberrant quality control results are noted, sample results should not be reported.

| CONTROL | INCUBATION | RESULTS |
|---|---|---|
| *Escherichia coli* ATCC® 25922 | Ambient, 18-24 h @ 33-37°C | Growth, pink colonies, blue-green fluorescence |
| *Klebsiella pneumoniae* ATCC® 27736 | Ambient, 18-24 h @ 33-37°C | Growth, pink colonies, no fluorescence |
| *Proteus mirabilis* ATCC® 12453 | Ambient, 18-24 h @ 33-37°C | Growth, colorless colonies, no fluorescence |
| *Salmonella enterica* serovar Typhimurium ATCC® 14028 | Ambient, 18-24 h @ 33-37°C | Growth, colorless colonies, no fluorescence |
| *Enterococcus faecalis* ATCC® 29212 | Ambient, 18-24 h @ 33-37°C | Inhibition (partial to complete) |
| *Staphylococcus aureus* ATCC® 25923 | Ambient, 18-24 h @ 33-37°C | Inhibition (partial to complete) |

## LIMITATIONS
1. Some strains of *Salmonella*, *Shigella*, and *Yersinia* possess the enzyme β-glucuronidase and may produce blue-green fluorescence on this medium. However, unlike *E. coli*, these organisms are nonlactose-fermenters.[2,5]
2. Some species of *Staphylococcus* and *Streptococcus* also possess the enzyme β-glucuronidase but are inhibited on this medium.[2,5]

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## BIBLIOGRAPHY


1. Dahlen, G. and A. Linde. 1973. Appl. Microbiol. 26:863-866.
2. Kilian, M. and P. Bulow. 1976. Acta. Pathol. Microbiol. Scand. Sect. B. 84:245-251.
3. Edberg, S.C. and R.W. Trepeta. 1983. J. Clin. Microbiol. 18:1287-1291.
4. Trepeta, R.W. and S.C. Edberg. 1984. J. Clin. Microbiol. 19:172-174.
5. MacFaddin, J.F. 1985. Media for Isolation-Cultivation-Identification-Maintenance of Medical Bacteria. Vol. 1. Williams & Wilkins, Baltimore, MD.


Refer to the front of Remel *Technical Manual of Microbiological Media* for **General Information** regarding precautions, product storage and deterioration, sample collection, storage and transportation, materials required, quality control, and limitations.




IFU 453841 Revised March 22, 2011 Printed in U.S.A.



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**12076 Santa Fe Drive, Lenexa, KS 66215, USA**
**General Information: (800) 255-6730 Website: www.remel.com Email: remel@remel.com**
**Local/International Phone: (913) 888-0939 International Fax: (913) 895-4128**