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# MACCONKEY AGAR

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## INTENDED USE

MacConkey agars are slightly selective and differential plating media mainly used for the detection and isolation of gram-negative organisms from clinical,<sup>1</sup> dairy,<sup>2</sup> food,<sup>3</sup> water,<sup>4</sup> pharmaceutical,<sup>5</sup> cosmetic,<sup>3</sup> and other industrial sources.

MacConkey Agar is used for isolating and differentiating lactose-fermenting from lactose-nonfermenting gram-negative enteric bacilli.

## SUMMARY AND EXPLANATION

MacConkey Agar is based on the bile salt-neutral red-lactose agar of MacConkey.<sup>6</sup>

The original MacConkey medium was used to differentiate strains of *Salmonella typhosa* from members of the coliform group. Formula modifications improved the growth of *Shigella* and *Salmonella* strains. These modifications included the addition of 0.5% sodium chloride, decreased agar content, and altered bile salts and neutral red concentrations. The formula improvements gave improved differential reactions between these enteric pathogens and the coliform group.

MacConkey Agar contains crystal violet and bile salts that inhibit gram-positive organisms and allow gram-negative organisms to grow. Isolated colonies of coliform bacteria are brick red in color and may be surrounded by a zone of precipitated bile. This bile precipitate is due to a local pH drop around the colony due to lactose fermentation. Colonies that do not ferment lactose (such as typhoid, paratyphoid and dysentery bacilli) remain colorless. When lactose nonfermenters grow in proximity to coliform colonies, the surrounding medium appears as cleared areas. MacConkey Agar is listed as one of the recommended media for the isolation of *E. coli* from nonsterile pharmaceutical products.<sup>5</sup>

## PRINCIPLE

Peptones are sources of nitrogen and other nutrients. Yeast extract is a source of trace elements, vitamins, amino acids and carbon. Lactose is a fermentable carbohydrate. When lactose is fermented, a local pH drop around the colony causes a color change in the pH indicator (neutral red) and bile precipitation. Bile salts, bile salts no. 3, oxgall and crystal violet are selective agents that inhibit growth of gram-positive organisms. Sodium chloride maintains osmotic balance in the medium. Magnesium sulfate is a source of divalent cations. Agar is the solidifying agent.

**REAGENTS (FORMULA)**

|                                    |        |    |
|------------------------------------|--------|----|
| Pancreatic Digest of Gelatin ..... | 17.0   | g  |
| Peptones .....                     | 3.0    | g  |
| Lactose .....                      | 10.0   | g  |
| Bile Salts No. 3 .....             | 1.5    | g  |
| Sodium Chloride .....              | 5.0    | g  |
| Neutral Red .....                  | 0.03   | g  |
| Crystal Violet .....               | 1.0    | mg |
| Agar .....                         | 13.5   | g  |
| Deionized Water .....              | 1000.0 | ml |

**PROCEDURE**

Refer to appropriate standard references for details on test methods to obtain isolated colonies from specimens or samples using MacConkey Agar.<sup>1-11</sup> Incubate plates for 18-72 hours at 35 ± 2°C under appropriate atmospheric conditions, or as instructed in the standard reference.<sup>1-6</sup>

**EXPECTED RESULTS**

Lactose-fermenting organisms grow as pink to brick-red colonies with or without a zone of precipitated bile. Lactose-nonfermenting organisms grow as colorless or clear colonies.

**QUALITY CONTROL**

All lot numbers have been tested and have been found to be acceptable. Customers can test products using the following quality control organisms. 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.

| <b>Organisms</b>                    | <b>Incubation</b>     | <b>Results</b>      |
|-------------------------------------|-----------------------|---------------------|
| <i>Escherichia coli</i> ATCC 25922  | 35 ± 2°C for 24 hours | Growth, Pink to red |
| <i>Proteus mirabilis</i> ATCC 12453 | 35 ± 2°C for 24 hours | Growth, Colorless   |

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