

MacConkey Broth

Intended Use

MacConkey Broth is used for the detection of coliform organisms in milk and water.

Meets *United States Pharmacopeia (USP)*, *European Pharmacopoeia (EP)* and *Japanese Pharmacopoeia (JP)*¹⁻³ performance specifications, where applicable.

Summary and Explanation

MacConkey Broth is a modification of the original bile salt broth recommended by MacConkey⁴ that contained 0.5% sodium taurocholate and litmus as an indicator. In later publications,^{5,6} MacConkey suggested variations of this formulation using neutral red indicator instead of litmus. Childs and Allen⁷ demonstrated the inhibitory effect of neutral red and substituted the less inhibitory bromcresol purple. Oxgall in the medium

replaces the original sodium taurocholate to inhibit growth of gram-positive organisms.

MacConkey Broth is used for cultivating gram-negative, lactose-fermenting bacilli and as a presumptive test for coliform organisms. It has been used to analyze food,⁸ milk^{9,10} and water samples¹⁰⁻¹³ for coliforms. In addition, this medium has also been used in the rapid detection of shiga-toxin producing *E. coli* in fecal samples.¹⁴ MacConkey Broth is recommended in the *USP* as a test medium for *E. coli* in the microbiological examination of nonsterile products.¹

Principles of the Procedure

Peptone provides amino acids and other growth factors. Lactose is a carbon energy source for gram-negative lactose-fermenting bacilli. Oxgall inhibits the growth of gram-positive organisms. Bromcresol purple is the indicator.

User Quality Control

NOTE: Differences in the Identity Specifications and Cultural Response testing for media offered as both **Difco™** and **BBL™** brands may reflect differences in the development and testing of media for industrial and clinical applications, per the referenced publications.

Identity Specifications

Difco™ MacConkey Broth

Dehydrated Appearance: Light beige, free-flowing, homogeneous.
Solution: 3.5% solution, soluble in purified water. Solution is purple, clear.
Prepared Appearance: Purple, clear.
Reaction of 3.5% Solution at 25°C: pH 7.3 ± 0.1

BBL™ MacConkey Broth (prepared)

Appearance: Purple and clear.
Reaction at 25°C: pH 7.3 ± 0.2

Cultural Response

Difco™ MacConkey Broth

Prepare the medium per label directions. Inoculate and incubate at 35 ± 2°C for 18-24 hours. For *E. coli* ATCC 8739 and *S. aureus* ATCC 6538, inoculate 100 mL bottles and incubate at 43-44°C for 18-48 hours.

ORGANISM	ATCC™	INOCULUM CFU	RECOVERY	ACID	GAS
<i>Enterococcus faecalis</i>	29212	10 ³	Marked to complete inhibition	–	–
<i>Escherichia coli</i>	25922	30-300	Good	+	+
<i>Salmonella enterica</i> subsp. <i>enterica</i> serotype Choleraesuis var. Kunzendorf	12011	30-300	Good	–	–
<i>Escherichia coli</i>	8739	<100	Growth (at 24 hours)	N/A	N/A
<i>Staphylococcus aureus</i>	6538	>100	No growth (at 48 hours)	N/A	N/A

KEY: + = positive, yellow for acid, gas
– = negative, no change for no acid, no gas

BBL™ MacConkey Broth (prepared)

Inoculate and incubate at 42-44°C for 18-48 hours.

ORGANISM	ATCC™	INOCULUM CFU	RECOVERY	ACID
<i>Escherichia coli</i>	8739	10 - 100	Growth	+
<i>Escherichia coli</i>	25922	10 - 100	Growth	+
<i>Staphylococcus aureus</i>	6538	>100	No growth	–

KEY: + = positive, yellow for acid
– = negative, no change for no acid



Formula

Difco™ MacConkey Broth

Approximate Formula* Per Liter

Oxgall	5.0	g
Pancreatic Digest of Gelatin	20.0	g
Lactose	10.0	g
Bromcresol Purple	0.01	g

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

Directions for Preparation from Dehydrated Product

1. Dissolve 35 g of the powder in 1 L of purified water. For testing 10 mL samples, prepare double strength.
2. Dispense in test tubes containing Durham tubes.
3. Autoclave at 121°C for 15 minutes.
4. Test samples of the finished product for performance using stable, typical control cultures.

Sample Collection and Handling

For milk or food samples, follow appropriate standard methods for details on sample collection and preparation according to sample type and geographic location.⁸⁻¹⁰

For water samples, follow appropriate standard methods for details on sample collection and preparation according to sample type and geographic location.¹⁰⁻¹³

For pharmaceutical samples, follow appropriate standard methods for details on sample collection and preparation according to sample type and geographic location.¹

Procedure

Refer to appropriate references for details on test methods using MacConkey Broth.⁸⁻¹³

Inoculate tubes with the test sample. Incubate tubes at $35 \pm 2^\circ\text{C}$ for 18-24 hours in an aerobic atmosphere, or as instructed in appropriate reference.⁸⁻¹³

Expected Results

Lactose-fermenting organisms grow very well in MacConkey Broth and produce acid, causing the medium to turn yellow. Gas is also produced, which collects in the Durham tubes. Nonfermenting organisms produce good growth but will not produce acid or gas.

References

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4. MacConkey. 1901. Zentralbl. Bakteriologie. 29:740.
5. MacConkey. 1905. J. Hyg. 5:333.
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7. Childs and Allen. 1953. J. Hyg. Camb. 51:468.
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9. Adeleke, Adeniyi and Akinrinmisi. 2000. Afr. J. Biomed. Res. 3:89-92.
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11. World Health Organization. 4 Sept 2008. European standards for drinking water, 2nd ed., online. <www.who.int/water_sanitation_health/dwg/eurostand2/en/index.html>.
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14. Teel, Daly, Jerris, Maul, Svanas, O'Brien and Park. 2007. J. Clin. Microbiol. 45:3377-3380.

Availability

Difco™ MacConkey Broth

EP ISO JP USP

Cat. No. 220100 Dehydrated – 500 g[†]

BBL™ MacConkey Broth

EP ISO JP USP

Cat. No. 215177 Prepared Bottles, 100 mL – Pkg. of 10[†]

Europe

Cat. No. 254957 Prepared Bottles, 100 mL – Ctn. of 25[†]

[†] QC testing performed according to USP/EP/JP performance specifications.