Lysine Iron Agar

Test agar introduced by EDWARDS and FIFE (1961) for the simultaneous detection of lysine decarboxylase (LDC) and hydrogen sulfide (H_2S) production for the identification of Enterobacteriaceae, especially for Salmonella and Arizona.

JOHNSON et al. (1966) and TIMMS (1971) obtained good results with Lysine Iron Agar. Identification is improved by using the medium in combination with Triple Sugar Iron Agar (THATCHER and CLARK 1968). HENNER et al. (1982) reported that Lysine Iron Agar is superior to other comparable culture media for differentiating between Proteus and Salmonella.

Mode of Action

Lysine is decarboxylated by LDC-positive microorganisms to give the amine cadaverine which causes the pH indicator bromocresol purple to change its colour to violet. As decarboxylation only occurs in an acidic medium (below pH 6.0), the culture medium must first be acidified by glucose fermentation. This medium can therefore only be used for the differentiation of glucose-fermenting microoganisms.

LDC-negative, glucose-fermenting microoganisms cause the entire culture medium to turn yellow. On prolonged incubation alkalinisation of the culture medium surface may occur, resulting in a colour change to violet. H_2S production causes a blackening of the culture medium due to the formation of iron sulfide.

Species of the Proteus-Providencia group, with the exception of a few Proteus morganii strains, deaminate lysine to give α-ketocarboxylic acid; this compound reacts with the iron salt near the surface of the medium, under the influence of oxygen, to form reddish-brown compounds.

Typical Composition (g/litre)

Peptone from meat 5.0; yeast extract 3.0; D(+)glucose 1.0; L-lysine monohydrochloride 10.0; sodium thiosulfate 0.04; ammonium iron(III) citrate 0.5; bromocresol purple 0.02; agar-agar 12.5.

Preparation

Suspend 32 g/litre, dispense into test tubes, autoclave (15 min at 121 °C). Allow to solidify to give agar slants.

pH: 6.7 ± 0.2 at 25 °C.

The prepared culture medium is clear and violet.

Experimental Procedure and Evaluation

Inoculate the medium with the pure culture under investigation by streaking it onto the slant surface and by a central stab into the butt.

Incubation: 16-24 hours at 35 °C aerobically.

Characteristic reactions of some Enterobacteriaceae cultured on Lysine Iron Agar:

Microorganisms	Butt	Slant surface	H_2S production
Arizona	violet	violet	+
Salmonella*	violet	violet	+
Proteus mirabilis Proteus vulgaris	yellow	red-brown	+
Proteus morganii Proteus rettgeri	yellow	red-brown	-
Providencia	yellow	red-brown	-
Citrobacter	yellow	violet	+
Escherichia	yellow	violet	-
Shigella	yellow	violet	-
Klebsiella	violet	violet	-

* Exception: Salm. paratyphi A (no lysine decarboxyloase production, butt = yellow, slant surface violet)

Literature

EDWARDS, P.R., a. FIFE, M.A.: Lysine iron agar in the detection of Arizona cultures. **- Appl. Microbiol., 9**; 478-480 (1961).

EWING, W.H., DAVIN, B.R., a. EDWARDS, P.R.: The decarboxylase reactions of Enterobacteriaceae and their value in taxonomy. **- Publ. Hlth. Lab., 18**; 77-83 (1960).

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RAPPOLD, H., a. BOLDERDIJK, R.F.: Modified lysine iron agar for isolation of Salmonella from food. **- Appl. Environ. Microbiol., 38**; 162-163 (1979).

THATCHER, F.S., a. CLARK, D.S.: Microorganisms in FOOD (University of Toronto Press. 1968).

TIMMS, L.: Arizona infection in turkeys in Great Britain. **- Med. Lab. Techn., 28**; 150-156 (1971).

Ordering Information

Product	Merck Cat. No.	Pack size
Lysine Iron Agar	1.11640.0500	500 g

Lysine Iron Agar

Quality control

Test strains	Growth	Butt	Slant
Shigella flexneri ATCC 12022	good / very good	yellow	violet
Escherichia coli ATCC 25922	good / very good	yellow	violet
Salmonella typhimurium ATCC 14028	good / very good	violet and black	violet
Salmonella enteritidis NCTC 5188	good / very good	violet and black	violet
Citrobacter freundii ATCC 8090	good / very good	yellow and black	violet
Proteus mirabilis ATCC 29906	good / very good	yellow and black	reddish-brown
Morganella morganii ATCC 25830	good / very good	yellow	reddish-brown / violet

Citrobacter freundii ATCC 8090

Morganella morganii ATCC 25830

Salmonella enteritidis NCTC 5188

Shigella flexneri ATCC 12022