

Microbiology: Biochemical Tests

Test	Medium	Substrate	Product(s)	Reagent	pH indicator	+ appearance	organisms +
Amylase	starch agar	starch	glucose, maltose, dextrins	iodine		colorless zone after iodine	<i>B. subtilis</i>
Caseinase	skim milk agar	casein	amino acids, peptides			clear zone	<i>B. subtilis</i>
DNase	DNase agar	DNA	nucleotides		methyl green	colorless zone	<i>S. aureus</i>
Lipase	spirit blue agar	lipid	glycerol, fatty acids			blue/clear zone, blue ppt.	<i>S. aureus</i>
Eosin Methylene Blue (EMB) agar ¹	EMB agar	lactose	organic acids			metallic green; fish eyes	<i>E. coli</i> ; <i>E. aerogenes</i>
MacConkey's agar ¹	MacConkey's agar	lactose	organic acids		neutral red	pink (+ ppt.)	<i>E. coli</i> ; <i>E. aerogenes</i>
Mannitol Salt Agar (MSA) ²	MSA	mannitol	organic acids		phenol red	yellow media	<i>S. aureus</i>
Indole	TSB	tryptophan	indole	Kovac's reagent		red at surface	<i>E. coli</i>
Methyl Red	MRVP broth	glucose	organic acids	methyl red		red throughout	<i>E. coli</i>
Voges-Proskauer	MRVP broth	glucose	non-acids	VP-A & VP-B		red at surface	<i>E. aerogenes</i>
Citrate Utilization	Simmons' citrate agar	citrate	Na ₂ CO ₃		bromthymol blue	royal blue	<i>E. aerogenes</i>
TSI: H₂S Gas	TSI agar	iron (sulfate)	iron sulfide		phenol red	black ppt.	<i>S. typhimurium</i>
TSI: Sugar Ferm.	TSI agar	glucose, lactose, sucrose	organic acids		phenol red	yellow	<i>P. vulgaris</i> (also + for H ₂ S)
Urease	(Christensen's) urea agar	urea	ammonia, CO ₂		phenol red	pink	<i>Proteus</i>
Catalase		hydrogen peroxide (H ₂ O ₂)	water, oxygen			bubbles	Staphylococci
Coagulase		fibrinogen	clumping factor-fibrinogen complex			blue ppt., solid	<i>S. aureus</i>
Hemolysis: α	5% sheep's blood agar	hemoglobin (red)	biliverdin (green/brown)			green/brown zone	<i>S. pneumoniae</i>
Hemolysis: β	5% sheep's blood agar	red blood cells	lysed red blood cells			clear zone	<i>S. pyogenes</i> , <i>S. aureus</i>
Carb. Ferm. Series	glucose, lactose, sucrose broth	glucose, lactose, sucrose	organic acids, CO ₂		phenol red	yellow, CO ₂ in Durham tube	
Nitrate Reduction	tryptic nitrate broth	nitrate	nitrite; ammonia	nitrate A & B, zinc		red color	
Oxidase						blue color	<i>P. aeruginosa</i>
Litmus	litmus milk	casein, lactose	various		litmus	various	

¹ selective for gram-negative bacteria; differential results indicated

² selective for salt-tolerant staphylococci; differential results indicated