

Table 31. Test for Detecting Inducible Clindamycin Resistance in *Staphylococcus* spp., *Streptococcus pneumoniae*, and *Streptococcus* spp. β -Hemolytic Group^{a,b}

Test	ICR			
	Disk Diffusion (D-zone test)		Broth Microdilution	
Organism group (applies only to organisms resistant to erythromycin and susceptible or intermediate to clindamycin)	All <i>Staphylococcus</i> spp.	<i>S. pneumoniae</i> and β -hemolytic <i>Streptococcus</i> spp.	All <i>Staphylococcus</i> spp. ^c	<i>S. pneumoniae</i> and β -hemolytic <i>Streptococcus</i> spp.
Medium	MHA or blood agar purity plate used with MIC tests	MHA supplemented with sheep blood (5% v/v) or TSA supplemented with sheep blood (5% v/v)	CAMHB	CAMHB with LHB (2.5% to 5% v/v)
Antimicrobial concentration	15- μ g erythromycin and 2- μ g clindamycin disks spaced 15-26 mm apart	15- μ g erythromycin and 2- μ g clindamycin disks spaced 12 mm apart	4 μ g/mL erythromycin and 0.5 μ g/mL clindamycin in same well	1 μ g/mL erythromycin and 0.5 μ g/mL clindamycin in same well
Inoculum	Standard disk diffusion procedure or heavily inoculated area of purity plate	Standard disk diffusion procedure	Standard broth microdilution procedure	
Incubation conditions	35°C \pm 2°C; ambient air	35°C \pm 2°C; 5% CO ₂	35°C \pm 2°C; ambient air	
Incubation length	16-18 hours	20-24 hours	18-24 hours	20-24 hours
Results	Flattening of the zone of inhibition adjacent to the erythromycin disk (referred to as a D-zone) = ICR. Hazy growth within the zone of inhibition around clindamycin = clindamycin resistance, even if no D-zone is apparent.		Any growth = ICR. No growth = no ICR.	

Table 3I. (Continued)

Test	ICR			
	Disk Diffusion (D-zone test)		Broth Microdilution	
Test method	All <i>Staphylococcus</i> spp.		All <i>Staphylococcus</i> spp. ^c	<i>S. pneumoniae</i> and β-hemolytic <i>Streptococcus</i> spp.
Organism group (applies only to organisms resistant to erythromycin and susceptible or intermediate to clindamycin)	<i>S. pneumoniae</i> and β-hemolytic <i>Streptococcus</i> spp.			
Additional testing and reporting	Report isolates with ICR as “clindamycin resistant.” The following comment may be included with the report: “This isolate is presumed to be resistant based on detection of ICR, as determined by testing clindamycin in combination with erythromycin.”			
QC recommendations - routine ^c	<i>S. aureus</i> ATCC ^{®d} 25923 for routine QC of erythromycin and clindamycin disks	<i>S. pneumoniae</i> ATCC [®] 49619 for routine QC of erythromycin and clindamycin disks	<i>S. aureus</i> ATCC [®] BAA-976 [™] or <i>S. aureus</i> ATCC [®] 29213 - no growth	<i>S. pneumoniae</i> ATCC [®] 49619 or <i>S. aureus</i> ATCC [®] BAA-976 [™] - no growth
QC recommendations - lot/shipment ^e			<i>S. aureus</i> ATCC [®] BAA-977 [™] - growth	
QC recommendations - supplemental ^f	<i>S. aureus</i> ATCC [®] BAA-976 [™] (D-zone test negative) <i>S. aureus</i> ATCC [®] BAA-977 [™] (D-zone test positive) Use of unsupplemented MHA is acceptable for these strains.		<i>S. aureus</i> ATCC [®] BAA-976 [™] (no growth) <i>S. aureus</i> ATCC [®] BAA-977 [™] (growth)	

Abbreviations: ATCC[®], American Type Culture Collection; CAMHB, cation-adjusted Mueller-Hinton broth; ICR, inducible clindamycin resistance; LHB, lysed horse blood; MHA, Mueller-Hinton agar; MIC, minimal inhibitory concentration; QC, quality control; TSA, tryptic soy agar.

Footnotes

- a. Antimicrobial susceptibility testing of β-hemolytic streptococci does not need to be performed routinely (see general comment [4] in Table 2H-1). When susceptibility testing is clinically indicated, test for ICR in strains that are erythromycin resistant and clindamycin susceptible or intermediate.
- b. In accordance with 2010 guidance from the Centers for Disease Control and Prevention, colonizing isolates of group B streptococci from penicillin-allergic pregnant women should be tested for clindamycin (including ICR) (see comment [12] in Table 2H-1).¹ For isolates that test susceptible to clindamycin (with erythromycin induction), consider adding the following comment to the patient’s report: “This group B *Streptococcus* does not demonstrate inducible clindamycin resistance as determined by testing clindamycin in combination with erythromycin.”

Table 3I. (Continued)

c. QC recommendations - routine

Test negative (susceptible) QC strain:

- With each new lot/shipment of testing materials
- Weekly if the test is performed at least once a week and criteria for converting from daily to weekly QC testing have been met (see Subchapter 4.7.2.3 in M02² and M07³)
- Daily if the test is performed less than once per week and/or if criteria for converting from daily to weekly QC testing have not been met

d. ATCC[®] is a registered trademark of the American Type Culture Collection. Per ATCC[®] convention, the trademark symbol is used after “BAA” in each catalog number, in conjunction with the registered ATCC[®] name.

e. QC recommendations - lot/shipment

Test positive (resistant) QC strain at minimum with each new lot/shipment of testing materials.

f. QC recommendations - supplemental

- Supplemental QC strains can be used to assess a new test, for training personnel, and for competence assessment. It is not necessary to include supplemental QC strains in routine daily or weekly AST QC programs. See Appendix C, which describes use of QC strains.

References for Table 3I

- ¹ Verani JR, McGee L, Schrag SJ; Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention (CDC). Prevention of perinatal group B streptococcal disease - revised guidelines from CDC, 2010. *MMWR Recomm Rep*. 2010;59(RR-10):1-36.
- ² CLSI. *Performance Standards for Antimicrobial Disk Susceptibility Tests*. 13th ed. CLSI standard M02. Clinical and Laboratory Standards Institute; 2018.
- ³ CLSI. *Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically*. 11th ed. CLSI standard M07. Clinical and Laboratory Standards Institute; 2018.