

Table 4A-1. Disk Diffusion QC Ranges for Nonfastidious Organisms and Antimicrobial Agents Excluding β -Lactam Combination Agents^a

Antimicrobial Agent	Disk Content	Disk Diffusion QC Ranges, mm		
		<i>Escherichia coli</i> ATCC ^{ob} 25922	<i>Pseudomonas aeruginosa</i> ATCC ^o 27853	<i>Staphylococcus aureus</i> ATCC ^o 25923
Amikacin	30 μ g	19-26	20-26	20-26
Ampicillin	10 μ g	15-22	-	27-35
Azithromycin	15 μ g	-	-	21-26
Azlocillin	75 μ g	-	24-30	-
Aztreonam	30 μ g	28-36	23-29	-
Carbenicillin	100 μ g	23-29	18-24	-
Cefaclor	30 μ g	23-27	-	27-31
Cefamandole	30 μ g	26-32	-	26-34
Cefazolin	30 μ g	21-27	-	29-35
Cefdinir	5 μ g	24-28	-	25-32
Cefditoren	5 μ g	22-28	-	20-28
Cefepime	30 μ g	31-37	25-31	23-29
Cefetamet	10 μ g	24-29	-	-
Cefiderocol	30 μ g	25-31	22-31	-
Cefixime	5 μ g	20-26	-	-
Cefmetazole	30 μ g	26-32	-	25-34
Cefonicid	30 μ g	25-29	-	22-28
Cefoperazone	75 μ g	28-34	23-29	24-33
Cefotaxime	30 μ g	29-35	18-22	25-31
Cefotetan	30 μ g	28-34	-	17-23
Cefoxitin	30 μ g	23-29	-	23-29
Cefpodoxime	10 μ g	23-28	-	19-25
Cefprozil	30 μ g	21-27	-	27-33
Ceftaroline	30 μ g	26-34	-	26-35
Ceftazidime	30 μ g	25-32	22-29	16-20
Ceftibuten	30 μ g	27-35	-	-
Ceftizoxime	30 μ g	30-36	12-17	27-35
Ceftobiprole	5 μ g	25-31	-	20-27
Ceftriaxone	30 μ g	29-35	17-23	22-28
Cefuroxime	30 μ g	20-26	-	27-35
Cephalothin	30 μ g	15-21	-	29-37
Chloramphenicol	30 μ g	21-27	-	19-26
Cinoxacin	100 μ g	26-32	-	-

Table 4A-1. (Continued)

Antimicrobial Agent	Disk Content	Disk Diffusion QC Ranges, mm		
		<i>Escherichia coli</i> ATCC [®] 25922	<i>Pseudomonas aeruginosa</i> ATCC [®] 27853	<i>Staphylococcus aureus</i> ATCC [®] 25923
Ciprofloxacin	5 µg	29-38	25-33	22-30
Clarithromycin	15 µg	-	-	26-32
Clinafloxacin	5 µg	31-40	27-35	28-37
Clindamycin ^c	2 µg	-	-	24-30
Colistin	10 µg	11-17	11-17	-
Delafloxacin ^d	5 µg	28-35	23-29	32-40
Dirithromycin	15 µg	-	-	18-26
Doripenem	10 µg	27-35	28-35	33-42
Doxycycline	30 µg	18-24	-	23-29
Enoxacin	10 µg	28-36	22-28	22-28
Eravacycline	20 µg	17-24	-	19-26
Ertapenem	10 µg	29-36	13-21	24-31
Erythromycin ^c	15 µg	-	-	22-30
Faropenem	5 µg	20-26	-	27-34
Fleroxacin	5 µg	28-34	12-20	21-27
Fosfomycin ^e	200 µg	22-30	-	25-33
Fusidic acid	10 µg	-	-	24-32
Garenoxacin	5 µg	28-35	19-25	30-36
Gatifloxacin	5 µg	30-37	20-28	27-33
Gemifloxacin	5 µg	29-36	19-25	27-33
Gentamicin ^f	10 µg	19-26	17-23	19-27
Gepotidacin	10 µg	18-26	-	23-29
Grepafloxacin	5 µg	28-36	20-27	26-31
Iclaprim	5 µg	14-22	-	25-33
Imipenem ^g	10 µg	26-32	20-28	-
Kanamycin	30 µg	17-25	-	19-26
Lefamulin	20 µg	-	-	26-32
Levofloxacin	5 µg	29-37	19-26	25-30
Levonadifloxacin	10 µg	27-33 ^d	17-23 ^d	32-39 ^d
Linezolid	30 µg	-	-	25-32 ^h
Lomefloxacin	10 µg	27-33	22-28	23-29
Loracarbef	30 µg	23-29	-	23-31
Mecillinam	10 µg	24-30	-	-
Meropenem	10 µg	28-35	27-33	29-37
Minocycline	30 µg	19-25	-	25-30
Moxalactam	30 µg	28-35	17-25	18-24

Table 4A-1. (Continued)

Antimicrobial Agent	Disk Content	Disk Diffusion QC Ranges, mm		
		<i>Escherichia coli</i> ATCC [®] 25922	<i>Pseudomonas aeruginosa</i> ATCC [®] 27853	<i>Staphylococcus aureus</i> ATCC [®] 25923
Moxifloxacin	5 μ g	28-35	17-25	28-35
Nafcillin	1 μ g	-	-	16-22
Nafithromycin	15 μ g	-	-	25-31 ^d
Nalidixic acid	30 μ g	22-28	-	-
Netilmicin	30 μ g	22-30	17-23	22-31
Nitrofurantoin	300 μ g	20-25	-	18-22
Norfloxacin	10 μ g	28-35	22-29	17-28
Ofloxacin	5 μ g	29-33	17-21	24-28
Omadacycline	30 μ g	22-28	-	22-30
Oxacillin	1 μ g	-	-	18-24
Pefloxacin	5 μ g	25-33	-	-
Penicillin	10 units	-	-	26-37
Piperacillin	100 μ g	24-30	25-33	-
Plazomicin	30 μ g	21-27	15-21	19-25
Polymyxin B	300 units	13-19	14-18	-
Quinupristin-dalfopristin	15 μ g	-	-	21-28
Razupenem	10 μ g	21-26	-	-
Rifampin	5 μ g	8-10	-	26-34
Solithromycin	15 μ g	-	-	22-30
Sparfloxacin	5 μ g	30-38	21-29	27-33
Streptomycin ^f	10 μ g	12-20	-	14-22
Sulfisoxazole ^j	250 μ g or 300 μ g	15-23	-	24-34
Sulopenem	2 μ g	24-30 ^d	-	-
Tebipenem ^g	10 μ g	30-37	20-26	-
Tedizolid ^k	2 μ g	-	-	18-24 ^h
Teicoplanin	30 μ g	-	-	15-21
Telithromycin	15 μ g	-	-	24-30
Tetracycline	30 μ g	18-25	-	24-30
Ticarcillin	75 μ g	24-30	21-27	-
Tigecycline	15 μ g	20-27	9-13	20-25
Tobramycin	10 μ g	18-26	20-26	19-29
Trimethoprim ^j	5 μ g	21-28	-	19-26
Trimethoprim-sulfamethoxazole ^j	1.25/23.75 μ g	23-29	-	24-32
Trospectomycin	30 μ g	10-16	-	15-20
Trovafloxacin	10 μ g	29-36	21-27	29-35
Ulifloxacin (prulifloxacin) ^l	5 μ g	32-38	27-33	20-26
Vancomycin	30 μ g	-	-	17-21

Abbreviations: ATCC[®], American Type Culture Collection, QC, quality control.

Table 4A-1. (Continued)

Footnotes

- a. Refer to Table 4A-2 for QC of β -lactam combination agents.
- b. 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.
- c. When disk approximation tests are performed with erythromycin and clindamycin, *S. aureus* ATCC® BAA-977™ (containing inducible *ermA*-mediated resistance) and *S. aureus* ATCC® BAA-976™ (containing *msrA*-mediated macrolide-only efflux) are recommended as supplemental QC strains (eg, for training, competence assessment, or test evaluation). *S. aureus* ATCC® BAA-977™ should demonstrate inducible clindamycin resistance (ICR) (ie, a positive D-zone test), whereas *S. aureus* ATCC® BAA-976™ should not demonstrate ICR. *S. aureus* ATCC® 25923 should be used for routine QC (eg, weekly or daily) of erythromycin and clindamycin disks using standard Mueller-Hinton agar.
- d. QC ranges were established using data from only one disk manufacturer. Disks from other manufacturers were not available at the time of testing.
- e. The 200- μ g fosfomycin disk contains 50 μ g of glucose-6-phosphate.
- f. For control ranges of gentamicin 120- μ g and streptomycin 300- μ g disks, use *E. faecalis* ATCC® 29212 (gentamicin: 16-23 mm; streptomycin: 14-20 mm).
- g. *Klebsiella pneumoniae* ATCC® 700603 is a supplemental QC strain for testing QC of imipenem (25-33 mm) and tebipenem (26-32 mm).
- h. Zones of inhibition for linezolid and tedizolid with *S. aureus* ATCC® 25923 should be read using transmitted light.
- i. Razupenem tested with *S. aureus* ATCC® 25923 can often produce the double or target zone phenomenon. For accurate QC results, use *S. aureus* ATCC® 29213 (no double zones) with acceptable range 33-39 mm.
- j. These agents can be affected by excess levels of thymidine and thymine. See M02,¹ Subchapter 3.1.1.2 for guidance, should a problem with QC occur.
- k. *E. faecalis* ATCC® 29212 is a supplemental QC strain for testing QC of tedizolid (14-21 mm) to assist with reading.
- l. Ulifloxacin is the active metabolite of the prodrug prulifloxacin. Only ulifloxacin should be used for antimicrobial susceptibility testing.

NOTE: Information in boldface type is new or modified since the previous edition.

Reference for Table 4A-1

- ¹ CLSI. *Performance Standards for Antimicrobial Disk Susceptibility Tests*. 13th ed. CLSI standard M02. Clinical and Laboratory Standards Institute; 2018.