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Table 1. Critical zone inhibition diameters (mm) and MICs ($\mu\text{g/ml}$) for the interpretation of susceptibilities of strains of *Neisseria gonorrhoeae* to selected antimicrobial agents. (Criteria for all agents except levofloxacin and azithromycin are those recommended by CLSI; criteria for interpretation of susceptibilities are those recommended by the NRL.)

Antimicrobial Agent	Zone Inhibition Diameters (nearest whole mm)			Equivalent MIC ($\mu\text{g/ml}$)		
	R	I	S	R	I	S
Penicillin (10 units)	≤ 26	27-46	≥ 47	≥ 2.0	0.125-1.0	≤ 0.06
Tetracycline (30 μg)	≤ 30	31-37	≥ 38	≥ 2.0	0.5-1.0	≤ 0.25
Spectinomycin (100 μg)	≤ 14	15-17	≥ 18	≥ 128.0	64.0	≤ 32.0
Ceftriaxone* (30 μg)	--	--	≥ 35	--	--	≤ 0.25
Cefixime* (5 μg)	--	--	≥ 31	--	--	≤ 0.25
Ciprofloxacin (5 μg)	≤ 27	28-40	≥ 41 **	≥ 1.0	0.125-0.5	≤ 0.06
Ofloxacin (5 μg)	≤ 24	25-30	≥ 31	≥ 2.0	0.5-1.0	≤ 0.25
Levofloxacin (5 μg)	.	.	.	≥ 1.0 ***	.	.
Azithromycin (15 μg)	≤ 30 ***	.	.	≥ 1.0 ***	.	.

Abbreviations. MIC, minimal inhibitory concentration; R, resistant; I, intermediate; S, susceptible.

- * Criteria for intermediate and resistant not available; strains have not been confirmed to cause clinical treatment failure. However, four isolates with MICs exhibiting decreased susceptibility to cefixime (MIC, range 0.25 - 1.0 $\mu\text{g/ml}$; modal MIC, 0.5 $\mu\text{g/ml}$) were identified among gonococcal isolates from Hawaii in 2001 (12).
- ** Preliminary MIC data suggest that isolates exhibiting zone inhibition diameters of ciprofloxacin of 35 to 41 mm are susceptible to ciprofloxacin (MIC ≤ 0.06 $\mu\text{g/ml}$). It is recommended that susceptibilities of isolates exhibiting zone inhibition diameters of 35 to 41 mm be confirmed by agar dilution susceptibility testing before isolates are categorized as being intermediate to ciprofloxacin.
- ***In the absence of CLSI-established criteria, the NRL recommends the use of critical MICs ≥ 1.0 $\mu\text{g/ml}$ to interpret susceptibilities of gonococcal isolates to these agents until more extensive assessments of clinical treatment outcome to these agents are available (see Special Notes). When gonococcal infections have been treated with the CDC-recommended dose of levofloxacin (250 mg, single dose, oral) or with azithromycin (2 g, single dose, oral), the isolation of gonococcal isolates with critical MICs of ≥ 1.0 $\mu\text{g/ml}$ of levofloxacin or azithromycin, respectively, from such infections should prompt further investigation to determine that such infections have been treated successfully. The NRL would appreciate receiving isolates with MICs of ≥ 1.0 $\mu\text{g/ml}$ of levofloxacin or azithromycin, or zone inhibition diameters of ≤ 30 mm of azithromycin for confirmation of susceptibilities.

Table 2a. Ranges of zone inhibition diameters (mm)* and equivalent MIC ($\mu\text{g/ml}$) range for reference strains of *Neisseria gonorrhoeae*

Antimicrobial agent (disk concentration)	Strain	Range of MICs and corresponding disk diffusion inhibition zone diameters (mm)						
		ATCC 49226 ^a	F-28	P681E	CDC 10328	CDC 10329	SPJ-15	SPL-4
		<i>Phenotype</i> ^b	<i>Susceptible</i>	<i>SpcR</i>	<i>PP-TR</i>	<i>CipI</i>	<i>CipR</i>	<i>AznC</i> ^c
Penicillin (10 units)	MIC Range	0.25-1.0	0.015-0.06	2.0- \geq 64.0	4.0- \geq 32.0	16.0- \geq 64.0	0.5-1.0	4.0-16.0
	Disk	[26-34]	[37-47]	[6-10]	<ND>	<ND>	<ND>	<ND>
Tetracycline (30 μg)	MIC Range	0.25-1.0	0.125-0.5	8.0-32.0	0.25-1.0	2.0-4.0	1.0-4.0	2.0-8.0
	Disk	[30-42]	[35-40]	[14-19]	<ND>	<ND>	<ND>	<ND>
Spectinomycin (100 μg)	MIC Range	8.0-32.0	>128.0	\leq 128.0	<128.0	<128.0	<128.0	<128.0
	Disk	[23-29]	[6-7]	[22-25]	<ND>	<ND>	<ND>	<ND>
Ceftriaxone (30 μg)	MIC Range	0.004-0.015	0.0005-0.002	0.002-0.008	0.002-0.015	0.004-0.03	0.004-0.015	0.03-0.25
	Disk	[39-51]	[49-62]	[43-53]	<ND>	<ND>	<ND>	<ND>
Cefixime ^d (5 μg)	MIC Range	0.004-0.03	0.001-0.008	0.008-0.03	0.004-0.03	0.008-0.06	0.008-0.06	0.25-0.5
	Disk	[37-45]	<ND>	<ND>	<ND>	<ND>	<ND>	<ND>
Ciprofloxacin (5 μg)	MIC Range	0.001-0.008	0.001-0.004	0.002-0.008	0.125-0.5	1.0-2.0	0.004-0.008	8.0-32.0
	Disk	[48-58]	[40-55]	[45-55]	[30-34]	[21-26]	<ND>	<ND>
Ofloxacin (5 μg)	MIC Range	0.004-0.015	0.004-0.015	0.004-0.015	0.25-1.0	2.0-4.0	0.008-0.03	16.0
	Disk	[43-51]	[40-55]	[40-50]	[27-32]	[18-21]	<ND>	<ND>
Levofloxacin ^d (5 μg)	MIC Range	0.008	0.004	0.004	0.25-0.5	1.0-4.0	0.008-0.015	8.0
	Disk	<ND>	<ND>	<ND>	<ND>	<ND>	<ND>	<ND>
Azithromycin ^d (15 μg)	MIC Range	0.125-0.5	0.03-0.125	0.03-0.125	0.015-0.125	0.125-0.5	1.0-8.0	0.125-0.5
	Disk	[27-36] ^d	<ND>	<ND>	<ND>	<ND>	[19-23] ^d	<ND>
β -Lactamase		-	-	+	+	+	-	-

Abbreviations. MIC, minimal inhibitory concentration ($\mu\text{g/ml}$); *SpcR*, spectinomycin resistant (MIC >128.0 $\mu\text{g/ml}$); *PP-TR*, penicillinase-producing with TetM conjugative plasmid; *CipI*, intermediate to ciprofloxacin (MIC 0.125-0.5 $\mu\text{g/ml}$); *CipR*, ciprofloxacin-resistant (MIC \geq 1.0 $\mu\text{g/ml}$); *AznC*, isolates exhibiting MICs of \geq 1.0 $\mu\text{g/ml}$ of azithromycin (see Special Notes in text); *CfxDS*, decreased susceptibility to cefixime (MIC >0.25 $\mu\text{g/ml}$ of cefixime); [ND], not determined; +, β -lactamase positive; -, β -lactamase negative.

a ATCC 49226 is the NCCLS-recommended quality control strain. MICs and inhibition zone diameters for ATCC 49226 are those recommended by the NCCLS except for MICs for azithromycin which were derived from interlaboratory testing by six laboratories.

b Phenotypes refer only to the susceptibilities for which the quality control strain is intended; strains may also exhibit additional resistance(s) of interest.

c SPJ-15, isolate with a critical MIC \geq 1.0 $\mu\text{g/ml}$ of azithromycin (see Special Notes in text).

d Zone inhibition diameters have not been determined for cefixime at this time and ranges for azithromycin may be extended as more measurements are made.

Table 2b Quality control values for antimicrobial susceptibilities of reference strains of *Neisseria gonorrhoeae* determined by agar dilution or Etest

Antimicrobial agent	Strain	MIC (µg/ml)						
		ATCC 49226 ^a	F-28	P681E	CDC 10328	CDC 10329	SPJ-15	SPL-4
	<i>Phenotype</i> ^b	<i>Susceptible</i>	<i>SpcR</i>	<i>PP-TR</i>	<i>CipI</i>	<i>CipR</i>	<i>AznC</i> ^c	<i>CfxDS</i>
Penicillin	MIC Range	0.25-1.0	0.015-0.06	2.0-≥64.0	4.0-≥32.0	16.0-≥64.0	0.5-1.0	4.0-16.0
	Modal MIC	[1.0]	[0.03]	[8.0]	<ND>	<ND>	[0.5]	[8.0]
Tetracycline	MIC Range	0.25-1.0	0.125-0.5	8.0-32.0	0.25-1.0	2.0-4.0	1.0-4.0	2.0-8.0
	Modal MIC	[1.0]	[0.25]	[16.0]	[0.5-1.0]	[2.0-4.0]	[1.0-2.0]	[4.0]
Spectinomycin	MIC Range	8.0-32.0	>128.0	≤128.0	<128.0	<128.0	<128.0	<128.0
	Modal MIC		[>128.0]	[≤128.0]	[≤128.0]	[≤128.0]	[≤128.0]	[≤128.0]
Ceftriaxone	MIC Range	0.004-0.015	0.0005-0.002	0.002-0.008	0.002-0.015	0.004-0.03	0.004-0.015	0.03-0.25
	Modal MIC	[0.015]	[0.001]	[0.004]	[0.004]	[0.008-0.015]	[0.008]	[0.125]
Cefixime	MIC Range	0.004-0.03	0.001-0.008	0.008-0.03	0.004-0.03	0.008-0.06	0.008-0.06	0.25-0.5
	Modal MIC	[0.03]	[0.002]	[0.015]	[0.008-0.015]	[0.015]	[0.03]	[0.5]
Ciprofloxacin	MIC Range	0.001-0.008	0.001-0.004	0.002-0.008	0.125-0.5	1.0-2.0	0.004-0.008	8.0-32.0
	Modal MIC	[0.004]	[0.002]	[0.004]	[0.25]	[1.0]	[0.004]	[8.0-16.0]
Ofloxacin	MIC Range	0.004-0.015	0.004-0.015	0.004-0.015	0.25-1.0	2.0-4.0	0.008-0.03	16.0
	Modal MIC	[0.004]	[0.008]	[0.008]	[0.5]	[2.0]	[0.015]	[16.0]
Levofloxacin ^d	MIC Range	0.008	0.004	0.004	0.25-0.5	1.0-4.0	0.008-0.015	8.0
	Modal MIC	[0.008]	[0.004]	[0.004]	[0.25-0.5]	[2.0]	[0.008-0.015]	[8.0]
Azithromycin	MIC Range	0.125-0.5	0.03-0.125	0.03-0.125	0.015-0.125	0.125-0.5	1.0-8.0	0.125-0.5
	Modal MIC	[0.25-0.5]	[0.06]	[0.06]	[0.03]	[0.25-0.5]	[2.0-4.0]	[0.25]
β-Lactamase		-	-	+	+	+	-	-

Abbreviations. MIC, minimal inhibitory concentration (µg/ml) ; *SpcR*, spectinomycin resistant (MIC >128.0 µg/ml); *PP-TR*, penicillinase-producing with TetMconjugative plasmid; *CipI*, intermediate to ciprofloxacin (MIC 0.125-0.5 µg/ml); *CipR*, resistant to ciprofloxacin (MIC ≥1.0 µg/ml); *AznC*, isolates with MICs of 1.0 µg/ml of azithromycin (see Footnote c); *CfxDS*, decreased susceptibility to cefixime (MIC >0.25 µg/ml of cefixime); [ND], not determined; +, β-lactamase positive; -, β-lactamase negative.

a ATCC 49226 is the NCCLS-recommended quality control strain. MICs for ATCC 49226 are those recommended by the NCCLS; MICs of azithromycin were determined by interlaboratory testing by six laboratories in the United States.

b Phenotypes refer only to the susceptibilities for which the quality control strain is intended; strains may also exhibit additional resistance(s) of interest.

c SPJ-15, isolate with a critical MIC ≥1.0 µg/ml of azithromycin (see Special Notes in text).

d MICs of levofloxacin are based on a limited number of tests.

In the absence of NCCLS-recommended criteria for the interpretation of susceptibilities of levofloxacin, it is recommended that laboratories determine susceptibilities to either ciprofloxacin or ofloxacin as an indication of resistance to levofloxacin.